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THE PRESENT STANDPOINT OF GEOGRAPHY.

Opening Address of the President, Mr. Clements R. Markham, C.B., F.R.S.*

The work of geographical discovery, during living memory, has proceeded with such rapidity that many of us have been half inclined to think that there is little left to be done. Brilliantly successful expeditions have traversed the unknown parts of the great continents, blank spaces on our maps have been filled up year after year, entrancing narratives of perilous adventure have held us in rapt attention during each succeeding session, until we are tempted to believe that the glorious tale is nearly told. But this is very far indeed from being the case. There are still wide tracts, in all the great divisions of the Earth, which are unknown to us, and which will furnish work to explorers for many years to come; while the examination of ocean depths is an important task which has but lately been commenced. Moreover, there are regions of vast extent which are only very partially known to us, the more detailed examination of which will enable explorers to collect geographical information of the highest value and of the greatest interest. It is from the methodical study of limited areas that science derives the most satisfactory results. When such investigations are commenced it is found how meagre and inaccurate previous knowledge derived from the cursory information, picked up during some rapid march, had been. A detailed scientific monograph on a little known region of comparatively small extent supplies work of absorbing interest to the explorer, while he has the satisfaction of knowing that his labours will be of lasting value and utility. There is sufficient work of this less ambitious, but not less serviceable kind to occupy a whole army of field geographers for many decades. Exact delineation, by trigonometrical measurement, is our crowning work. It is barely commenced. With

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the exception of countries in Europe, British India, the coast of the United States and a small part of its interior, the whole world is still unmapped. Supposing that the surface of the Earth does not undergo changes, our work will be completed centuries hence when all the regions of the Earth have been discovered, have been explored in detail, and have been scientifically mapped. As the Earth's surface is in constant process of change our work will never be completed, and we must, as a race of men, labour at it without ceasing. We of this generation have received the torch of geographical knowledge from our fathers. It is for us to diffuse its light over a wider and wider circle while we live, and to hand it on, still burning brightly, to our descendants.

All of us, all the Fellows of this great Society, ought to work in our several lines and capacities; for all can help in the diffusion of the light of knowledge, some in one way some in another. I have thought, therefore, that we might usefully set apart the opening night of our present session for taking a survey, it must necessarily be a rough and incomplete survey, but still a general survey of some of the work that is before us; of the regions that are still unknown and await discovery, of the tracts that seem most to need more detailed exploration, and of the principal geographical problems that remain to be solved. We may also glance at the ways in which our Society has furnished in the past, and may still more in the future furnish, aid towards furthering and helping in the great work that is always before us.

The Polar areas contain by far the most extensive unknown tracts on the globe. Explorers and geographers have been occupied with the Arctic regions for the last three centuries, and more especially during the last century. Their labours have added a very bright page to the story of British maritime achievement. The expeditions have brought back abundant valuable results in all branches of science, and by opening the way to lucrative fisheries, have increased the wealth of the nation. But their great use has been that to which Lord Beaconsfield referred in 1874, "the importance of encouraging that spirit of enterprise which has ever distinguished the English people." At present it is our watch below as regards the Arctic regions. We have taken a back seat, from which we look on while others do the work. Mr. Peary, after a very perilous and adventurous reconnaissance last year, is now preparing, amidst all the hardships of an Arctic winter, for a supreme effort to solve one of the great remaining geographical problems, the insularity of Greenland. Our gallant friend Nansen is engaged upon a still more heroic enterprise. I believe that the argument on which his proceedings are based is sound. I know that if thorough knowledge, mature reflection, courage of the highest order, indomitable perseverance, and the faculty for command can secure success, Nansen is the man to achieve it. But the natural obstacles are very great, and it may well be beyond human power to overcome them. We can only give these

gallant men our warmest sympathy, and resolve that our welcome on their return shall be hearty and cordial.

But even when the great geographical problems with which Nansen and Peary are now grappling have been fully solved, there will still be a vast unknown area within the Arctic circle, and much important work to be done. For several reasons I believe that there is land between Prince Patrick Island and Siberia which ought to be discovered. The extent of the ancient ice ought to be ascertained by an expedition up Jones Sound. Franz Josef Land, particularly the coasts and islands on its northern face, offer materials of peculiar interest to the explorer. Mr. Jackson, who left last summer to explore the Yalmal Peninsula, has proposed to lead an expedition in this direction. The difficulties will be formidable and ought not to be disguised, but the value of the scientific results to be attained are well worth the unavoidable risk. Another direction for research is the area immediately to the north of Cape Chelyuskin in Siberia, where Lieutenant Hovgaard, on plausible grounds, believes that there is extensive land. It will occupy at least five successive Arctic expeditions, all entirely successful, to complete our knowledge of the North Polar area, and this Society ought never to rest satisfied until the work is thoroughly done. For it must be borne in mind that this work will not only unfold to us the varied phenomena of the unknown regions. The Earth's surface is a connected whole, and its phenomena are inter-dependent. For example, the climate of Europe, as was pointed out in 1873, in no small degree depends on the atmospheric conditions of the Polar area. For the satisfactory appreciation of these phenomena a precise acquaintance with the distribution of land and water north of the Arctic circle is quite necessary; and of that our knowledge is still very limited.

If a vast extent of the North Polar area is still unknown, and if, as is undoubtedly the case, its complete examination is a scientific desideratum, how much more is this the case within the South Polar area? The Antarctic regions, with millions of unknown square miles full of geographical work, and teeming with the most interesting scientific problems, have been totally neglected by us for half a century. It is not necessary that I should say more, because at our next meeting Dr. John Murray will address us fully on the important results to be derived from Antarctic discovery, and stir up our enthusiasm as geographers and our patriotism as Britons, so that we may all combine in a hearty effort to procure the renewal of Antarctic research. Certainly fifty years is a long time for us to have totally neglected so vast and so important a field for geographical discovery. We may now look forward to a most interesting Antarctic meeting on November 27th, and, meanwhile, we will continue our survey of the other parts of the world, which either need further exploration, or are entirely unknown.

There is plenty of interesting work even in *our* quarter of the globe,

although there are now no discoveries to be made. Even in our own islands some of the lakes are unsurveyed, and were not systematically sounded until our accomplished librarian began the useful work in Cumberland this year. The topography of the Alps may be considered to be fairly complete, but there are still physical enquiries of great interest which commend themselves to scientific Alpine travellers, such as the extent and action of ice, the oscillations of glaciers, the origin of the Föhn wind, and the effects of the destruction of forests. The historical geography of the Alps is also in process of elucidation; and in this department our associate, the Rev. W. B. Coolidge, of Magdalen College, Oxford, is one of the most industrious workers; but much remains to be done. It will be remembered, too, that our secretary, Mr. Douglas Freshfield, has written a paper on the long-disputed passage of the Alps by Hannibal, and, although his solution of the question has not been universally accepted, it is adopted in the latest edition of Arnold's 'Rome.' Beyond the Alps there is need of a fuller description of the Cantabrian Highlands along the north of Spain; but it is the Balkan Peninsula which offers the best new ground in Europe for mountain travellers. This year our Oxford travelling scholar, Mr. Cozens-Hardy, has been investigating one of the least-explored and worst-mapped regions in Europe, that on the frontiers of Montenegro. The value of his work is best shown by the fact that the Intelligence Department have undertaken the production of a map based on his observations. On the borderland of Europe and Asia the Caucasus has been revealed to us, and we have been made familiar with the splendour of its forests and frozen crests, within the last quarter of a century, thanks to our Gold Medallist, Dr. Radde, and other Alpine climbers. In this region Signor W. Sella, our honorary associate M. de Décby, and Mr. H. Woolley have conspicuously proved what photography can do to present a living picture of the physical features, and of the inhabitants of a hitherto little known country. Recently the Russian Government has undertaken a survey of the Caucasus, and the results, as far as they are available, reflect the highest credit on the officers employed; but the range is of great extent, and here there is plenty of room for mountain travellers to break new ground.

The regions not yet traversed by explorers on the continent of Africa have shrunk very considerably since I became a Fellow of this Society. Barth and Vogel were then at work in the direction of Timbuktu and Lake Chad, Dr. Baikie was on the Niger, Dr. Livingstone was making his way to the coast at Loando, and Mr. Galton's companion, Anderssen, had reached Lake Ngami, Burton had just proposed his expedition to Harar. Tanganyika, Victoria Nyanza, and Nyasa, the falls of the Zambesi, the heights of Kilimanjaro and Kenia had not been heard of. In those days almost every expedition that was sent into Africa revealed to us some geographical feature of commanding importance, corroborating or refuting the theories and speculations of students.

At present there are only three regions—in Africa—of considerable area, which offer opportunities for discovery on a large scale, namely, the Sahara, the region adjoining it to the south, and extending across Wadai to the watersheds of the Congo and Nile; and the region to the east of the Upper Nile, stretching south of Abyssinia, through the lands of the Gallas and Somalis, to the eastern seaboard of the continent.

In the Sahara there are more especially two districts which would reward an enterprising explorer. One has for its centre the highlands of Tibesti, for our knowledge of which we are solely dependent on the reports of Nachtigal and Gerhard Rohlfs. The other is the highland of Ahaggar. Colonel Flatters lost his life in an attempt to explore it in 1881, yet the difficulties cannot be insurmountable. Great interest attaches to a thorough examination of the Atlas mountains, but they are still rendered inaccessible, in some parts, by fanatical tribes.

The second large unknown African region includes Wadai, and the districts lying between the scene of Junker's exploration in the east, and the route recently taken by M. Maistre, in his journey from the Ubangi to the Shari. Wadai has only been visited by three Europeans. Dr. Vogel was murdered at Wara in 1856, and his diaries have never been recovered. Nachtigal crossed the country from west to east in 1873. Lieutenant Masari did so in the opposite direction in 1880. A European traveller would doubtless meet with considerable difficulties in an exploration of Wadai proper, but the outlying districts of this region certainly deserve attention, and they are now much more easily accessible from the Ubangi-Welle or the upper Benue, than they were some years ago.

Far more interesting, however, is the vast region, the greater part of which is unexplored, which stretches from the Upper Nile to the Indian Ocean. It includes not only the territories of the Galla and Somali, but also those highlands to the south of Abyssinia, where little progress has been made since the visit of D'Abbadie to Kaffa in 1843. There are commercial, as well as geographical motives for opening up these almost unknown highlands. When I was at Senafè, in Abyssinia, a merchant arrived from Kaffa or Enarea, with donkeys laden with coffee. I had an interesting conversation with him, Dr. Krapf acting as my interpreter. The man said that he had crossed the whole of Abyssinia to find a market for his goods, and that he was on his way to Massawa. We afterwards heard that he was robbed and murdered in the Dagonta Pass: so that he never reached his market. This incident has always given me a special interest in the highlands south of Abyssinia; and parts of them have recently been visited by Italian travellers. Chiarini and Cecchi made their way from Shoa to Kaffa, Soleillet reached Kaffa in 1882, Borelli explored the sources of the Hawash in 1888, and reached the Omo flowing to Lake Rudolf, and Dr. Traversi examined the upper Hawash, and Dr. Stecker reached Lake Zuway. The interesting lake district to the south of Shoa is probably most accessible

from the north. But assaults should be made on the southern extremity of the great Abyssinian mountain plateau from the east or the south, by expeditions starting from Kisimayu or Lake Rudolf. Mr. Chanler, with Lieutenant Höhnel, and Captain Bottego, who are at present in the field, may possibly solve the problem of the sources of the Jub, but even if they do succeed, there will still remain splendid opportunities for future expeditions.*

The Italians have recently made great efforts to ascertain the geographical features of the Somali country. Signor Bricchetti-Robecchi, especially, has travelled along the whole coast from Mukadisho to Allula, and has also crossed the Somali country, from Obbia on the shore of the Indian Ocean to Berbera on the Gulf of Aden. We had the pleasure of welcoming this ardent explorer in the autumn. He had previously written a charming book describing his visit to the oasis of Jupiter Ammon.

The country west of the Jub lies within the British sphere of influence, and the interests of geography, no less than those of commerce, make it desirable that its exploration should be undertaken by British travellers. As soon as friendly relations can be established with the Somali and Galla living at the back of Kisimayu, an expedition into the country of the Borana Galla ought not to meet with insuperable difficulties. Camels, horses, and donkeys are procurable there, so that the work of explorers would be much facilitated. A depot might be established on or near Lake Rudolf, a district which is said to be rich in ivory, and relations might thence be established with the tribes intervening between that lake and the highlands south of Abyssinia, including Kaffa and Enarea. Exploring journeys both from the Shoa country to the south, or northwards from Lake Rudolf, would lead to a region which, although the last to be taken in hand, is certainly one of the most interesting in the interior of Africa.

Outside the regions just referred to, we may be said to have obtained a fair knowledge of the general geographical features of the African continent. Much detail remains to be filled in, and much of the work, executed in a hasty and superficial manner, requires to be done over again. There are also regions of great interest which have been visited, but which will well repay detailed examination. The mountains of Ruwenzori were discovered by Stanley, and have since been passed, on the west side, by Stuhlmann. Captain Lugard, whom you had the pleasure of welcoming from Uganda in the last session, was the first to pass them on the eastern side. These mountains, and the country between them and Lake Tanganyika, comprise a piece of work which Mr. Scott Elliot has just set out with the intention of

* Captain Bottego has since returned to Europe. An account of his expedition will appear in the next number of the Journal.

carefully executing. Most valuable results may, I think, be anticipated from his labours.

Excellent work of the same character has just been completed by our correspondent, Dr. Gregory, on Mount Kenia, and we may anticipate a most interesting paper from this accomplished explorer in the course of the Session.

Many of the itineraries which crowd and fill up our maps, are based upon very imperfect materials. Mr. Ravenstein, whose unrivalled knowledge of all that concerns the mapping of Africa is well known, has pointed out to me the want of reliable scientific observations even on routes which have been traversed several times. It is not possible to lay them down on a map with any confidence, in consequence of these deficiencies. The Victoria Falls of the Zambesi, for instance, have been visited by scores of travellers, but their exact geographical position is still uncertain. Careful astronomical observations have never been taken there. Then again the statements as to the height of Lake Ngami above the sea, actually vary between 2260 and 3700 feet. The Tioge, which enters that lake on the north, has been repeatedly ascended, but observations for latitude have never been taken. Similar instances of opportunities neglected might be adduced from all parts of Africa, the most deplorable one being that of the now abandoned Egyptian Sudan, where an extensive net of telegraphic wires was never utilised for determining the longitudes of Khartum and other places of importance.

On the other hand, we must remember the admirable work done by our distinguished gold-medallist, Mr. O'Neill, in fixing the position of Blantyre. Equally careful observations have been taken by the Belgian officers in the Basin of the Congo and on the shores of Lake Tanganyika. Nor must I fail to record the good work of the members of the Anglo-Portuguese, Anglo-French, and Anglo-German Boundary Commissions; and of the officers of the Royal Engineers who carried out the surveys for a proposed Mombasa-Victoria railway. We must recognise established facts. It is the work of scientific and carefully-trained explorers that we now need in Africa. The time for desultory exploring expeditions is past. Some parts of Africa, including Algeria and Tunis, Cape Colony, Natal, and Eritrea are now actually being surveyed. An extension of such surveys, on the system proposed by Colonel Trotter at the Cardiff meeting of the British Association, to other districts already occupied by Europeans, is much to be desired. In the end they would prove cheaper than repeated expeditions yielding imperfect or unreliable materials for the map-maker.

Their extension over the greater part of Africa cannot of course be thought of for many years to come. But I believe that it would be quite possible to drive certain carefully selected trunk lines across the continent, which would serve as bases for all future exploration,

and which would enable us to utilise existing materials far more efficiently than can be done at present. The positions of the main stations on these trunk lines would be carefully fixed by astronomical observations; and there should be a number of meteorological stations supplied with standard barometers, so that we may be able to compute our aneroid observations with some confidence in the results.

Such is the work of the future as regards the African continent. There are two great areas of the Sahara to be discovered. There is Wadai to be explored. We hope that a well-equipped English expedition will, before very long, set out from a base on Lake Rudolf, and penetrate the highland region south of Abyssinia. We also hope to receive much valuable geographical information from the contemplated work of the Hausa Association. There are numerous pieces of local exploration, such as the work undertaken by Mr. Scott Elliot in the Ruwenzori, which are both interesting and important. Lastly there is the establishment of lines of fixed positions and of meteorological stations which ought to be kept steadily in view by us, and pushed forward as opportunity offers. This is the pioneer work which will keep well in advance of regular surveys. The pace of African discovery, during my time, has been fast and furious. Hereafter it will be more steady, and the work will be more scientific. We are proud, as a nation, of the illustrious men who, in the face of appalling sufferings and hardships, and in spite of what might well appear insuperable difficulties, have supplied us, in a comparatively short number of years, with a general knowledge of the interior of Africa. We shall have to ask for equally high qualifications as travellers from those who will, in the future, emulate the examples of Livingstone and Burton, of Speke and Grant, of Cameron and Stanley; and also for scientific attainments of a high order. That the right men will come to the front—who can doubt? Some indeed are already in the field. We must not, however, forget the warning voice of my illustrious predecessor, Sir Bartle Frere. "No country," he said, "possesses the best raw material in such perfection as Great Britain. The strong physical constitution, the buoyant energy, the keen power of observation, the good-humoured indifference to opposition and danger, the determination not to be beaten, are more common among our youth, more lasting among our seniors, than in most other races. But this very abundance of natural gifts is apt to give us a dangerous contempt for artificial culture. How often have our working geographers lamented the neglect of systematic training by some of our most enterprising travellers." These wise words were addressed to you twenty years ago, and I believe that they were taken to heart. Our young explorers now pay much more attention to their scientific training than they did formerly. There is plenty of important work, and plenty of very hard work in Africa still; and I am confident that Britain will produce the right men to do it, and to do it well. If there are sucking Wellingtons

and Nelsons among us, there are also sucking Burtons and Livingstones. The magnificent raw material surrounds us; and the men who possess the physical advantages enumerated by Sir Bartle Frere, will surely add to them the needful scientific knowledge, when they find that it is thus that they must qualify to become good explorers. As our country has produced great African travellers in the past, so she will send them forth in the future. As long as there is work to be done, I say again that there will be no lack of volunteers.

In the continent of Asia British geographers have been very active during the present century. They have made a trigonometrical survey of India, and we know what those few words signify, what high scientific attainments were required, what hardships and dangers had to be encountered, what heavy loss of life was entailed, and we also know how fruitful were the results. The names of Rennell, of Everest, of Waugh, of Montgomerie, and of our eminent colleagues Generals James T. Walker and Sir Henry Thuillier, will for ever occupy very honourable niches in our geographical temple. British explorers have also surveyed and mapped Mesopotamia and Syria, Persia and Afghanistan, they have navigated the Chinese rivers, penetrated over the passes of the Himalaya, traversed the deserts of Manchuria and Turkistan, and discovered the source of the Oxus. Still they have left a great deal for their successors to do.

Perhaps the most interesting and important unknown Asiatic region is the southern part of Arabia, from Yemen on the west to Oman on the east, and between the sea-coast and the states of Nejd in the interior. This unknown region is upwards of 450 miles in extent, both in length and breadth. Hadramaut, with its lofty mountains and cultivated ravines, its settled population and historic past, is almost a sealed book to us. The little we know is derived from the narrative of journeys made by Baron von Wrede in 1843, and from the more recent excursion of Colonel Miles in 1870. Wrede's stories of Himyaritic inscriptions, wild mountain passes, mysterious quicksands, and terraced cultivation only quicken our longing to know more. Hadramaut, like the Antarctic continent, has been totally neglected by us for half a century. I am happy to be able to announce to you that our accomplished associates, Mr. and Mrs. Bent, accompanied by a Mohammedan surveyor from India and other assistants, are about to undertake the exploration of this practically unknown region. The excellent work they have already accomplished gives us the assurance that when we welcome their return we shall find that they have brought back a rich store of valuable and interesting information.

Leaving Arabia and Syria, we find much work yet to be done in Asia Minor. The most important unexplored field includes the upper valley of the Euphrates and Eastern Cappadocia, and towards this part of the work our Society has already made a liberal contribution. Next,

turning our attention to Persia, we come to a country which has been explored and reported upon by many of our countrymen since the days of Sir John Malcolm, and which has now, thanks to our colleague, Mr. Curzon, been admirably mapped. Yet even here, as I am informed by Mr. Curzon, plenty of useful geographical work remains to be done; while a good deal of information that has been collected by officers despatched by the Intelligence Department at Simla continues to be "secret and confidential." Thus there are several gaps which it is in the power of private travellers to fill in, so that Persia still affords an interesting and far from exhausted field for geographers.

Entering from the west, although the frontier province of Azerbaijan has, in its northern half, been systematically explored and mapped by Russian surveyors, in its southern parts and on the Turkish border attention might usefully be paid to the Persian Kurds, both nomad and sedentary, the former mostly in the mountains, the latter in the triangle of which the three points are Suj-Bulah, Bijar, and Sinna. Farther south, Luristan still remains unexplored in many parts, especially in the western subdivision called Pusht-i-Kuh, the home of the Feili Lurs. Since Sir Henry Rawlinson and Sir A. Layard were there fifty years ago these regions have been almost unvisited. Again, to the west of the route, from Tehran to Ispahan, there is a number of small districts which are very imperfectly known; while west of the road from Ispahan to Shiraz there is an absolute blank on the thirty-third parallel, between Kumishah and Yezd. Farther south, the Bashakerd province and Persian Baluchistan are very little known and largely unexplored, and in Luristan there is a blank space on the maps between the coast range and the caravan route from Faizabad to Lar. So that it will be seen that there is a great deal to which a young geographer might devote his energies in Persia. The same may be said of Baluchistan, where, between Kharan and the Mekran coast, except along the old Kafilah route from Lus-Bela to Panjgur (which was traversed by Sir R. Sandeman in 1890), the map is almost a blank.

Parts of Afghanistan are very dangerous for Europeans to be employed in, and our knowledge of the mountain-ranges between Kabul and Herat, which are occupied by the Hazara and other tribes, is most inadequate. Our ignorance of Kafiristan is complete. We still know nothing whatever of that interesting country, and its exploration is very desirable. Officers have been on its frontier—Colonel Tanner on the side of the Kunar River, my old friend, Sir William Lockhart, on the north, and the late Mr. McNair from the side of Chitral. But the country itself, from the passes of the Hindu Kush to the banks of the Kunar, is unknown. Its exploration is one of the great geographical achievements that remain to be done in Asia. The results would be important both from a political, a geographical, and possibly a commercial point of view, and there could be few nobler ambitions for a

young aspirant than to be the first explorer of Kafiristan. In Southern Afghanistan much also remains to be done, as, for instance, in the tracts to the west of the British frontier, between the Zhob and the Kurram valleys.

The Pamir table-land has been largely explored by several European travellers; but there is plenty of room for further work, and a systematic survey of the whole region would be a valuable contribution to geography. Further to the east the plains of Turkistan have been elaborately explored, and are sufficiently well known. The mountains and hills to the south, however, being spurs from the Mustagh-Himalayan ranges, are very imperfectly understood. It is doubtful, for instance, whether the Yarkand River, which rises in those ranges, flows some distance westward before it enters the plain, or whether it breaks through the mountains 30 or 40 miles to the east, and proceeds direct to Yarkand. A fairly accurate survey of the northern slopes of the Himalayan ranges and the adjoining portions of Eastern Turkistan is much needed, although a great deal of good work has quite recently been executed in the loftier parts of those ranges.

The recent journey of Mr. Conway among the glaciers and higher passes of the Mustagh-Himalayas is an example of what the courage and skill of an able private explorer may do under the most difficult circumstances. Starting from Hunza and Nagar, he surveyed a considerable area of country at great altitudes, and he has been able to correct and add to the survey of this region, which was executed by Colonel Godwin Austen. Fellows of the Society have already listened to Mr. Conway's graphic narratives, and before long his painstaking and minutely accurate map of one of the most remarkable portions of the Himalayan glacier region will be in your hands. In the same region, but still further north, officers of the Indian Survey are pushing their observations, and we may hope in due time to be furnished with the results. Another surveyor, Mr. Senior, has done much valuable work under circumstances of unusual difficulty, among the higher ranges of Kula and Lahaul. His merits have been recognised by our Council, and he has been awarded our Murchison Grant.

Further to the east, along the Himalayan chains, the kingdom of Nepal covers a tract of country about 500 miles long and 100 miles broad, lying between the crests of the mountains and the British frontier. This is still almost a blank upon our maps. Europeans, except a few officers at the capital, are debarred by treaty from entering Nepal, so that the country is very imperfectly known. The passes from Nepal into Tibet have a special interest for us, because the only great army that has invaded India since the commencement of British rule in Bengal marched through one of them—the Kirong Pass—and so descended from the valley of the Tsanpo into Nepal. It has never, I believe, been visited by any European.

Lhasa, the capital of Tibet, has never been visited by any Englishman since the days of Manning. There is also a vast and wholly unexplored region of Tibet on the north-west, between the parallels of 34° and 36° and the meridians of 82° and 90°. It lies between the explorations of Captain Bower on the south side, and those of Colonel Pevtsof and M. Bogdanovich on the north. In south-west Tibet there are also great belts of unknown country between the routes of Pundit Nain Sing from Ladak to Lhasa, and his route along the upper course of the Yaro-Tsanpo River; also between that river and the crests of the Himalayan ranges, which form the border of Western Nepal. The course of the Tsanpo and the adjoining country on both banks are well known as far as the meridian of 93°, and fairly well, but with some uncertainty, to 94° 10′. But from that point down to its entrance into the Assam Valley, under the name of the Dihong River, it is wholly unknown. So also is the country eastwards up to the meridian of 97° —a region which is probably the basin of the tributaries of the Dibong River, which flows into the Lohit-Brahmaputra a few miles above the point where the latter river joins the Dihong or Tsanpo.

The great rivers of Central and Eastern Tibet—the Giama-Nu-Chu, the Lantsan, and the Di-Chu—are fairly well known in parts; but there are considerable portions of the first river, more particularly, which need further exploration. There is considerable uncertainty whether, below where there is a ferry on the road from Dayul to Kima, the Giama-Nu-Chu flows southward as the source of the Salwin, or southwestwards, and is the principal source of the Irawadi. This is a geographical problem of great interest, and offers a splendid opportunity for ambitious young explorers to win their spurs. This whole region of complicated mountain and river systems, which still conceals the sources of the great Burmese streams, urgently calls for bold and hardy explorers to disentangle it. It is the borderland of several races, mostly broken up into minute tribal divisions, which present the same interest to the anthropologist as their country does to the geographer.

In Burma itself much information is still needed to complete our knowledge of its geography; but this desideratum is being systematically attended to by the Indian Survey Department. In Siam Mr. McCarthy has recently constructed a map, and the trade routes between Chieng Mai and the Upper Mekong have been traversed by Holt Hallett, Carl Boch, Archer, and others. But the region lying to the south, between the Menam Valley and the Lower Mekong is almost unknown to Englishmen. A thorough acquaintance with the country on the western side of the Mekong is very desirable: such as the cis-Mekong parts of Luang Prabong and of Nan, and the parts intended to be opened up by the projected railway from Bangkok to Korat. I may here mention that a valuable communication has just been received from Mr. H. Warington Smyth, describing his voyage up the Menam and

his journeys in the mountainous country to the west of the Mekong. Our young correspondent is a son of our former colleague, the late Sir Warington Smyth, and a grandson of our President Admiral Smyth, to whom the Society owes so much, and who was one of our seven founders. Mr. Warington Smyth's narrative is of geographical value and is charmingly written, and it is pleasant to find that in this instance the geographical mantle of my distinguished predecessor has so worthily descended on his grandson. In the Malay Peninsula there is also much to be done; and Mr. Lake has just brought home some good surveying work of previously unexplored country in the territory of Johore. But we have to deplore the death of Mr. Becher, who unfortunately lost his life in a river in the southern part of the Malay Peninsula just after he had entered upon what promised to be a useful piece of geographical work.

Passing over the great Empire of China, which has been traversed in numerous directions, and the geography of which is tolerably well understood, we come to Korea. In this peninsula, which until lately had scarcely been visited, the pack roads between the principal towns are now pretty well known, but there remain a number of routes on the western side, from Söul down to the south coast, and on the east side between Gensan and Fusan, which Mr. Curzon informs me have either not been traversed in modern times or are wholly unexplored. There is very great need of a survey and map of Korea, and, apart from the pack roads, the mountainous parts of the country are quite unknown. There is thus very considerable scope for geographical enterprise in this great peninsula, which may be looked upon as one of the numerous allurements which the unknown parts of the world present to the explorer.

Leaving the great Asiatic continent, and turning our attention to the mass of islands to the south, and stretching away eastward to the Pacific, we shall find that the most important future work will have to be done by the hydrographer rather than by the geographer. Doubtless there are many unreported reefs and shoals, and others whose recorded positions require verification. Yet when we think of the splendid work of Mr. Wallace in the Malay Archipelago, and of the lonely residence of Mr. Forbes on Timor Laut, there can be no doubt that much is also left for the explorer to do on land among those lovely islands. Sir William Macgregor will steadily proceed with the examination of British New Guinea, and will encourage all well-conceived schemes of discovery. Mr. Woodford tells me that, in his opinion, a properly equipped expedition would have little difficulty in passing from the head-waters of the Fly to those of the Empress Augusta River, and so crossing New Guinea in its broadest part. Meanwhile the interior of Dutch New Guinea is a complete blank—another of the vast tracts which await discovery. Here there is an extensive range marked on the maps as the Charles Louis Mountains, and attaining a height of 16,000 feet. The particular exploration of this range would

offer work for geographers and naturalists for many years to come Another interesting piece of work for a young explorer to undertake would be a definite solution of the question whether a passage exists right through the supposed isthmus from Maclure Gulf to Geelvink Bay, as has been reported. More knowledge of the islands to the north of New Guinea is also needed, where the natives present the chief obstacle to exploration. In the Solomon Islands, Mr. Woodford was successful in visiting the interior of Guadalcanal, but Bougainville Island is still absolutely virgin ground, and I am informed by Mr. Woodford that there is a most interesting elevated coral lagoon to the north of the island of New Georgia which has hitherto been undescribed; while Rennell and Bellona Islands, to the south of the Solomon group, are said to be elevated about 400 feet above the sea, yet exclusively of coral formation. The natives are Polynesian, not of Melanesian race, and they would certainly well repay a visit. The whole question of the mingling of Polynesian and Melanesian types on these groups of islands calls for careful investigation, as well as further study of the formation of coral reefs. Mr. Woodford suggests that it would be desirable, if funds could be obtained for the purpose, to make an experimental bore with a diamond drill upon some island of purely coral formation, situated in very deep water, and as far removed as possible from any high land. He thinks one of the islands of the Gilbert or Ellice groups would be suitable for the experiment.

It is unlikely that there are now any undiscovered islands in the Pacific, although I well remember the time when we fully expected that there might be, and when we were ordered to enter in the deck log, during our watches, the visibility of distant objects. Thus our tracks formed belts varying from 10 to 15 miles wide, within which no new islands were to be found.

Australia has now been explored in its whole extent. The work was watched with the deepest interest and sympathy by our Society; and no less than twelve Australian explorers have received our gold medal. Queensland, New South Wales, Victoria, and South Australia proper are thoroughly well known; but in Western Australia there are still large isolated tracts of the country in the interior which are unexplored. The most important lies east of the 120th meridian and between about 21° and 24° south. Mr. Ernest Favenc points out that the important geographical fact to be determined by an examination of this tract would be the settlement of the question whether Sturt's Creek again reformed, after having been for a time lost. Probably some patches of pastoral country and some unconnected water-channels and saline swamps would also be found. Mr. Favenc considers that the geographical problem to be worked out in Australia, during the ensuing years, is the evolution of a last river system, which will fill up the gap between the heads of the west coast rivers and the Lake Eyre

system. It is not likely that such a system will exist in anything more than a fragmentary form, but certain fixed drainage rules peculiar to that region may be found to exist which would dispel the present notion that the creeks there run at random to all points of the compass. The northern coast regions are now well known and fairly well settled throughout by sheep-farmers; and the gold discoveries in the south-west of the continent are extending inland and may reach the unexplored space, as belts of auriferous country are known to exist across the interior.

In New Zealand, as Mr. Douglas Freshfield has recently pointed out, a glorious field is open for the mountaineer, for the so-called Southern Alps have the glaciers of the Alps, the forests of the Caucasus, and the fjords and waterfalls of Norway all brought into close juxtaposition. Stirred by the success of Mr. Green's ascent of Mount Cook, the young New Zealanders have formed an Alpine club under the presidency of Mr. Harper. The proper line of exploration would be to continue establishing huts on both sides of the range, so that the relation and divergences between the west and east flanks may be fully investigated. Hitherto the east side has been principally explored.

Australia now has Geographical Societies of her own, active and learned bodies which are doing good work. It has been suggested by Baron Sir Ferd. von Mueller, and his idea has been adopted by his colleagues in Australia, that, with the object of establishing close affiliation between the parent Society and all the branches, our Council might annually elaborate a series of questions for transmission to our colonial and provincial colleagues. Such questions might refer to tidal observations, oceanic currents, the most important spots for additional hypsometrical data, accurate determination of longitudes, and the settlement of new projects for exploration. I am quite of opinion that this suggestion is well worthy of the consideration of our Council.

The New World, including the two continents of North and South America, has been in process of discovery for the last four centuries. The nearer parts had to be settled before the more distant parts could be explored. The whole of the coasts, indeed, have been surveyed with more or less completeness, and the United States Coast Survey is a monument of rigorous accuracy. But much of the interior is still unknown or very partially explored. This is certainly the case in the Dominion of Canada; and Dr. George M. Dawson recently said that we are far from having acquired even a good general knowledge of fertile lands with a rigorous climate which will only yield hardy crops, although comparatively little of the region capable of producing wheat is now altogether unknown. Then there are vast tracts of unknown country where possible mineral wealth would be the only material incentive for their exploration.

Within the Arctic Circle there is an unknown area covering 9500

square miles, between the eastern boundary of Alaska, the Porcupine River and the northern coast. Another area of 32,000 square miles of considerable interest, and probably containing the head-waters of the White and Tanana Rivers, lies west of the Lewes and Yukon, and extends to the Alaska frontier. There is an unknown tract of 27,000 square miles between the Lewes, Pelly, and Stikine Rivers, which lies on the direct line of the metalliferous belt of the Cordillera. Between the Pelly and Mackenzie Rivers there are 100,000 unknown square miles, including nearly 600 miles in length of the main range of the Rocky Mountains. Our Back Grant testimonialist, the Abbé Petitot, has made a short journey into the northern part of this area from the Mackenzie River, but otherwise no published information exists respecting it. Another Arctic area, between the Great Bear Lake and the northern coast, covering 50,000 square miles, is also unknown; and yet another of 35,000 square miles south of the Great Bear Lake, except for the journeys of the Abbé Petitot and Mr. Macfarlane. Further south there is an unknown tract of 81,000 square miles, between the Stikine and Liard Rivers to the north, and the Skeena and Peace Rivers to the south, and another of 7500 square miles between the Peace, Athabasca, and Loon Rivers. An unexplored area south of the Athabasca Lake is 35,000 square miles in extent.

Turning again to the Arctic Regions there is an area of 7500 square miles east of the Coppermine and west of Bathurst inlet, and another of 31,000 square miles between the Back River and the Arctic coast. I quote Dr. Dawson's figures, but I do not forget the work that has been done by Mr. Warburton Pike from the love of adventure, sometimes living on cariboo, at others on musk oxen, at others on cachés formed when game was abundant, and at others suffering from starvation. With no companions, save a few Indians, he has crossed and recrossed the barren lands of America. We next come to the vast unknown tract of 178,000 square miles between the Back River and the west coast of Hudson's Bay, part of which was wandered over but not mapped or explored by Hearne in 1769–72, and I believe it has also been traversed by Mr. Pike. There are smaller unknown areas to the south of Hudson's Bay, while the whole interior of Labrador, covering 289,000 square miles, is entirely unknown beyond the short routes of Professor Hind, Mr. Low and Mr. Holme, and Père Lacasse. This tract is believed to be more or less wooded, and in some parts with timber of large growth; but the practical utility of its future exploration will probably be derived from its metalliferous ores. Dr. Dawson sums up his enumeration of unknown areas with the calculation that out of the 3,470,287 square miles which form the area of the Dominion of Canada, 954,000 square miles at the very least are entirely unknown. In looking forward to the future examination of these areas, Dr. Dawson remarks that the explorers should be possessed of scientific training and be able to make intelligent

and accurate observations. The work of Mr. Green and of Mr. Topham in the Selkirk Range of British Columbia has been excellent, and it has brought to our notice a region of the greatest orographic and geological interest, part of which is still unmapped and unvisited.

In the United States there is much that remains to be done in Alaska, although the labours of Mr. Fred. Whymper, Seton-Karr, Topham, Nelson, and Ogilvie have thrown light on the alpine regions with their extensive glaciers, which culminate at Mount St. Elias and on the basin of the Yukon. In the vast territory of the Union itself surveying work of a more exact and rigorous character is making progress, and the admirable coast survey from the Bay of Fundy to the mouth of the Rio Grande on the east side, and from the Strait of Juan de Fuca to San Diego on the Pacific side is completed. Its merits were cordially recognised by this Society when our gold medal was conferred upon Professor Bache in 1858. Inland topography, however, owes most to the geologists, for Powell in the Rocky Mountains region, Hayden in the territories, and Clarence King on the 40th parallel have been obliged to make their maps as they proceeded with their geological investigations. The triangulation in the interior of the States was commenced late and its progress has been slow.

There is a great deal of work for an explorer in Central America, where our associate, Mr. Maudslay, has done so much excellent service, and where we are also indebted to the researches of officers from British Honduras. But it is in South America that the most extensive unexplored regions are still awaiting the visits of scientific travellers. Many parts of the Columbian Andes need exploration as well as the basins of the great rivers Japura and Putumayo, and some of the smaller affluents of the Amazon, such as the Pastasa, Morona, Santiago, Napo and Tigre. There is an enormous tract in Colombia bounded by the slopes of the Andes on the west, by the Orinoco and Rio Negro on the east, on the north by the Meta, and on the south by the Uaupes and Japura, which is practically unknown. I have called attention to this region on previous occasions in the hope that some one would undertake its exploration. For it was here that the old conquerors of the 16th century, without watch or compass, sought for El Dorado. Another unknown region lies between Guiana and the Amazon, while the rivers Jurus, Jutay, and Teffé are unexplored. The admirable survey of the great River Purus and its main tributary secured for Mr. Chandless the gold medal of our Society; but many of the affluents of the Beni, flowing from the Andes of Cuzco, still require scientific exploration.

The mighty Cordilleras of the Andes have only been very partially examined. From Mr. Whymper's delightful book, with its superb illustrations, we learnt much about the famous peaks of Ecuador, and some of our ideas received correction; while the surveying labours of

Mr. Wolf, in the same region, have led to the examination of the little known provinces between the Andes and the Pacific and to the production of a most valuable map of Ecuador. In Peru the learned President of the Lima Geographical Society, our honorary associate, Dr. Luis Carranza, has admirably described the geography of some of the provinces of the Andes. Still there is an undescribed Andean region, comprised in the provinces of Lucanas, Parinacochas, Cangallo, Aymaraes, and Cotabamba; and in the coast valleys and deserts between Nasca and Lajes. Forbes, Minchin and Wiener have ascended Illimani and Illampu, but the mountains of the coast-range further south are almost unknown, and the great peaks of Sajama and Pallahuari are still unmeasured.

Indeed, the whole orography of western South America is very imperfectly understood, and would well repay further scientific examination. The great rivers of the Gran Chacu, flowing from the Bolivian Andes to the Paraguay, are still incompletely explored, especially the more northern streams. Captain Page read a most interesting paper on the subject at our meeting on January 28th, 1889. In the discussion which followed I mentioned that the Gran Chacu was one of those regions to which geographers might point, when they were tauntingly asked what was left for them to discover. Captain Page has since lost his life—a martyr to science and to duty. His work will be taken up by others where he has left it. The exploration of these streams, especially of the Utuquis, and the region through which they pass, must needs be completed. For some day they will form great fluvial highways of commerce. Further south there are tracts needing examination, especially along both sides of the dividing line between Chile and the Argentine Republic, as well as in Patagonia. The government of Neuquen is one of these, a region with mountain slopes covered with beech (*Fagus Antarctica*) and pine (*Araucaria Brasiliensis*) forests, and with active volcanoes along its summits; while its rocks abound in fossil shells and wood, and send forth thermal springs. The belief that in this district, the Collon-cuá (called in its upper part the Mumini) flowing to the Atlantic, has its source in the same lake as the Bio Bio, flowing to the Pacific, would be an interesting point for an explorer to clear up. I rejoice to find, from an interesting memorandum furnished me by Captain Don Benjamin Garcia Aparicio, of the Argentine Corps of Engineers, that exploration is being zealously promoted and encouraged by our sister Geographical Society at Buenos Ayres.

We have now made a general survey of the unexplored and undiscovered *lands* of our globe. But the work of geographers is by no means confined to the land.

It is nearly forty years since Maury published the first edition of his 'Physical Geography of the Sea.' He was the founder of a new, and most interesting branch of our science, which treats of the ocean depths, of the currents and temperatures of the sea, of its biology, and

of the surface of the ocean bottoms. In 1855 this was a new field of research; when the *Arctic* and the *Cyclops* were running their first lines of soundings across the North Atlantic; and when Brooke and Wallich were inventing the first apparatus for bringing up samples from great depths. Since then, through the labours of scientific officers of several nationalities, the gates of this new field have been opened wider and wider. The result is due to the invention of improved appliances and to the persevering work of deep-sea soundings and dredgings as well in narrow seas as in the great oceans. This, of course, is not work for individual explorers, but rather for the governments of maritime nations. Yet I would urge upon the attention of naval officers, of officers of the naval reserve, and of the mercantile marine, that they all have frequent opportunities of adding to our knowledge, and of doing useful work in forwarding the examination of the depths of the sea, and in contributing to our knowledge of meteorology.

An immense mass of work remains to be done to enable us to have even a rough and general knowledge of the ocean depths. Additional lines of soundings are needed in all directions, especially in the southern ocean and in the Central Pacific, to bring out their general configuration. We now have a rough idea of the areas of greatest depths, the greatest of all having been obtained off the coast of Japan by the *Tuscarora* in 4655 fathoms; but the soundings of the *Challenger* between St. Thomas and Bermuda, and of the *Egeria* in the Pacific come very near to it. The discovery of the very greatest ocean depth will be most interesting, but it would be still more so to discover and map the submarine ranges and peaks to within, say, 500 fathoms of the surface. I remember that when the *Valorous* ran a line of soundings across the North Atlantic in August 1875, we got 1860 fathoms on one day, 1450 on the next, and only 690 on the next, bringing up pieces of black volcanic stone. On the two following days the depth increased to 1250 and 1485 fathoms. Here there was clearly either a volcanic peak or a ridge; and wherever these are known to occur I think that it would be very desirable to explore the surrounding ocean bed, and ascertain their extent and character. We want also the establishment of a more complete study of the system of ocean currents, by a very extensive use of floats adapted to swim at various depths; and also a fuller investigation of the temperature and density of the water surrounding the shores of all the continents. The work hitherto done in the North Sea and the neighbouring Atlantic is practically confined to the summer months, and a detailed examination at all seasons is needed. Such work is now being done under the auspices of Professors Petterssen of Sweden and Mohn of Christiania, Krümmel of Kiel, and the Fishery Board of Scotland. We also require a determination of the isotherms and isobars on land and sea at all seasons, which will primarily involve prolonged observations in the south-polar region, and a more complete knowledge of the

variation of atmospheric pressure with height, and its independent variation in different horizontal planes. Such an investigation embraces the whole question of the use of the barometer or boiling-point thermometer in measuring heights.

This will conclude my enumeration of the geographical desiderata in the field. It is a long and formidable list, affording work for many decades of years to come. But many of my associates know very well, and the rest must now clearly understand, that it is by no means an exhaustive list; but only such an enumeration as our limited time will admit of our making, merely a rough general survey of the work in the field that remains to be done.

The work of explorers is co-ordinated and rendered useful in many ways by geographical students, whose valuable labours desire equal attention and encouragement. There are many geographical problems which must be solved as well by the examination and inter-comparison of the work of numerous explorers in different regions, as by the careful study and application of the achievements of the devotees of our science in past centuries. The advance and extension of geography depends as much upon its students and scholars as upon its discoverers and explorers. Comparative geography is indeed one of the highest branches of our science. By identifying sites, comparing descriptions written long ago with the actual surface of the ground, and by demonstrating the changes which have taken place within historical times, it is an indispensable auxiliary to physical geography. We shall, I am sure, all be glad to receive the results of the investigations of our Oxford Travelling Scholar, Mr. Grundy, who has compared the narative of Herodotus with the actual ground where the battle of Platæa was fought. Comparative geography also enables us to comprehend the gradual evolution of our science, through the discoveries and life-long studies of a long series of devoted men during a succession of ages. Such knowledge is of the deepest interest. We, therefore, welcomed in 1891 Dr. Schlichter's ably reasoned paper on Ptolemy's topography of eastern Equatorial Africa; and we shall be glad to receive further results of his researches. Mr. Ryland's long and careful bibliographical and mathematical study of Ptolemy, and his laborious corrections and verifications, have also resulted in an important addition to Ptolemaic literature.

The spirit in which geographical students enter upon their researches, and the methods they adopt, have a special interest at a time when the educational efforts of the Society justify the expectation that their numbers will soon increase. Dr. H. S. Schlichter, who has already communicated the most interesting paper on Ptolemy's geography of Africa—to which I have just alluded—has explained to me his system of investigation. He not only uses history for the solution of physical phenomena, but also resorts to physical facts and observations for solving questions of historical geography. By looking at the problem

under consideration in all its bearings, and the various ways which seem to lead to its solution, an insight is obtained into the nature of the questions we have to deal with, and into the trustworthiness of the sources of our information. Such studies lead from one problem to another, they open up new questions and lines of research, and not only connect physical and historical facts of all times and ages, but also join our own minds and thoughts with those of men who lived and worked centuries before us. Hardly any branch of science is of greater interest in this respect than comparative geography, because wherever we turn we discover links which connect the development of our race with the changes on the surface of our planet.

Dr. Schlichter is now engaged in studying the desiccation of parts of Africa, and he has, with great labour and research, drawn a series of sections across that continent. The subjects—in physical geography—which offer themselves for the investigation of the student are, indeed, as numerous as they are fascinating. The processes of denudation, of erosion, and of transportation may be studied and compared; while—as Professor Lapworth has pointed out—the agencies which rule in the processes of upheaval and depression are still almost entirely unknown to us. The Professor's address, delivered at Edinburgh last year, on the crests and troughs which succeed each other on the Earth's surface in endless sequence, of every gradation of size, of every degree of complexity, offers much matter for reflection to the student of geography. The geological fold—as described in Professor Lapworth's address—should receive the attention of physical geographers who can take advantage of their great opportunities as explorers and as students, by investigating as well the simple fold, often under altered conditions caused by erosion, as the tangential pressures and other influences that have been at work on it. Thus we should combine with geologists in working out nature's problems, while we study the Earth's past history in order to understand its present condition; for although the limits between the sciences of geography and geology have been clearly defined, the difference between our studies consists rather in our methods and objects than in the materials on which we work. We are, therefore, prepared to give a cordial welcome to Mr. Oldham's promised paper on the present condition of the surface of British India, as explained by its former geological history.

If a competent acquaintance with geology is required for an accomplished geographical explorer, a knowledge of biology is equally desirable. For instance, the study of the fauna of inland lakes and rivers has been pointed out, by Darwin and Peschel, as important in connection with many problems in physical geography. It is two thousand years ago since Eratosthenes, who presided over geographical science at Alexandria, drew scientific conclusions from the fact that certain shells were found near the oasis of Jupiter Ammon. It was by the study of the fauna of

large lakes in North America and in Asia that their marine origin was established; while we deduce the former existence of lands now submerged, from the comparison of fossil animals. Plants have acted an equally important part, both in effecting the condition of the Earth's surface, and in revealing to us its former history.

I anticipate that such investigations will occupy some of our present and future students and explorers as they have occupied their predecessors; but they will I trust always bear in mind that the basis of all geographical work, if it is to be really valuable, is the fixing of positions astronomically. Accuracy and reliability can alone make their work permanently useful. Much attention ought, therefore, to be given to the handling and adjustment of instruments, and to their improvement. Experience in the field often leads to suggestions which bear fruit when they are carefully thought out. Thus there have been several forms of range-finders invented in recent years, which might be used in making rough surveys. Both Sir George Airy and Mr. Merrifield have introduced new methods of computing lunars, and a method of semi-azimuths, invented by a yachtsman, is now under discussion. Dr. Schlichter has recommended the use of an apparatus for photographing moon and stars for lunars, which is described in the November Number of our *Journal*, and Colonel Stewart invented another apparatus for surveying by photography. Improvements are sure to suggest themselves to intelligent workers. Major Watkin has improved on the aneroid. Several attempts have been made to improve the artificial horizon. Major Verner has invented a compass to be used for travelling at night.

Photography now occupies an important place in relation to geography, and a photographic camera should form part of the equipment of all explorers engaged in original geographical work. It is to be regretted that travellers have not taken more advantage of the facilities afforded by the Society, as the use of an instrument should be thoroughly mastered before a traveller proceeds on a journey. In photometry it is necessary that objects represented on the plate should be clear and well-defined, to facilitate the taking of measurements from them; and this has now become specially important since the invention of the new method of taking lunars.

It is in the direction of the improvement of instruments, cameras, and other appliances used by the traveller, and of methods of observing and computing, that experienced and ingenious men should continue to turn their inventive faculties. Very often an improvement occurs to an observer while using an instrument in the field, which afterwards, by following up the train of thought, leads to the perfection of a practically useful invention. This has been the case from the days of Martin Behaim to those of Leigh Smith.

Many of the rising generation of geographers, whose talents lie in

that direction, will also, it is to be hoped, master the beautiful and most useful art of the cartographer, including the work of the compiler and of the draughtsman. At present there are none too many in this country. When we reflect on the exquisite specimens of Italian and Catalan *portolani* which are preserved in the British Museum, and on the great geographical interest attaching to early examples of cartography, it is impossible not to regret that we are unable to produce an atlas such as the Berlin Geographical Society brought out last year. There are as yet no adequate opportunities, in this country, for developing the latent powers of the potential Kretschmers who doubtless exist among our young English geographers, but I trust that every encouragement will be given to those who, in the future, give their attention to this branch of our work.

Turning once more to the qualifications of an explorer, Mr. Galton has suggested to me that the art of geographical description is a very needful one. It is seldom that a country resembles what the visitor has been led to expect from reading recent descriptions of it. It is not the so called "word painting," now so elaborately employed, that conveys the most correct picture; but rather pithy epithets and sharp clear touches. The old writers were often excellent in doing this, with their forcible homely language; and they should be read until some echo of their pure vigorous style has been caught. The necessity for cultivating the describing faculty, and for studying the general principles underlying all good description should be inculcated by those who train men as geographical explorers; for a traveller is of no use if, when he comes back, he fails to convey to others a correct idea of what he has seen.

The various subjects to which a geographical student or explorer can give his attention are as fascinating as they are numerous; and whether he devotes his talents to the improvement of instruments, or to the work of the draughtsman and map-maker, or to the manifold phases of physical geography, or to discovery in distant lands, or to the elucidation and illustration of the history and progress of our science, he will alike be furthering, and advancing our objects, and will have a right to claim our assistance and our sympathy.

We do not invite geographers to enter upon any of these difficult undertakings without being prepared to supply them with a suitable training, and to give them all the sympathy and encouragement in our power. This was not always the case. I well remember that a young officer in command of the Hausa police force came to me for advice, just twenty years ago. He wanted to learn the use of the sextant and artificial horizon. At first I had no answer to give him. But afterwards I found out that a widow lady, named Janet Taylor, gave the required instruction in the Minories to mates of merchant ships. It was this dearth of the means of learning the work of an explorer that

forced my attention on the duty of finding a remedy. Mrs. Taylor was an efficient teacher, I believe, but the Minories are far off, and her single efforts could not supply what was needed. It was then that I submitted proposals, that the Society should appoint an instructor and furnish the necessary facilities for enabling explorers to learn their work. Our Council saw the importance of supplying a great need, and Mr. Coles was appointed to instruct intending travellers in practical astronomy and surveying. My proposal included instruction in geology and biology, and now arrangements are made for teaching what an explorer would need in these branches of knowledge also, as well as in photography. I look upon this as the most successful measure that has been adopted by this Society in recent years, and the one which has done most to advance the interests of geography. Since Mr. Coles began to give instruction in surveying and nautical astronomy, he has taught two hundred and thirty-nine pupils, including officers in the army and navy, in the consular and colonial services, missionaries, civil engineers, and private travellers. These instructed explorers have done valuable geographical work in all parts of the world: in Africa, Asia, North and South America, the Malay Archipelago and Pacific Islands, and in the Arctic Regions. Of the two-hundred and thirty-nine pupils, twenty have studied photography, eighteen botany and forty geology, in addition to surveying and nautical astronomy. It is of the utmost importance that explorers should be thoroughly trained for their work, and their instruction is consequently one of the most indispensable duties of our society.

In this imperfect survey of our geographical *desiderata* I have endeavoured to draw the attention of my associates, not only to the extent of unknown country to be discovered and explored, and to the numerous problems and questions of interest which await solution, but also to the duty that is laid upon us, each one of us—to take his share of the task, some by useful advice and co-operation, some by encouragement, all by a hearty determination to work together for one great end—the usefulness and prosperity of our Society.

Admiral Sir Leopold McClintock: It is most gratifying to me to be permitted to propose the resolution which I think follows the reading of the address. I have had the pleasure of knowing the President for a very long time; more than forty years ago we served together in the same ship throughout an Arctic winter. During the long interval since that time, he has devoted almost the whole of his conspicuous talents and his amazing industry to the advancement of geographical knowledge. He has himself taken part in exploration of no ordinary degree of hardship. He has travelled in many unfrequented lands and under many difficulties, and as a geographical student, he has made many researches, and has brought to light many interesting and valuable facts. I think it is to the last of these efforts that we are indebted for a biography of Christopher Columbus, the greatest of all geographical discoverers; it is a most interesting and delightful narrative, one of the most delightful in our language. We, the Fellows of this Society, know well how long and how

faithfully he has laboured at the council board to promote the increase of geographical exploration and research, to diffuse geographical information, and to make more generally known and felt the practical utility of geographical science. The address to which we have just listened is so instructive, so interesting, that it testifies to a very long course of special study. I am quite incompetent to speak of its varied merits, but I will venture to say here, that from what we know of Clements Markham in the past, we, the Fellows, are all of one mind, that he is eminently qualified to direct the labours and guide the future of this great Society on its distinguished course of invaluable work. And here in passing I beg leave to allude to the very honourable mention of our President in to-day's *Times* newspaper; it recognises in him the originator of the chinchona plantations in India, a work of extreme value. I beg therefore to propose that our best thanks be given to the President for his very able and instructive address, and to express a hope that he will allow it to be printed and circulated among the Fellows of the Society.

Capt. LOVETT CAMERON: Allow me to second that motion heartily. When I started for my journey across Africa, the most hearty supporter I had was the present President of the Geographical Society. During all the difficulties I had on my journey, I rested my heart on what he did for me, and I have never found any more loyal friend in this world than the present President of the Royal Geographical Society. I had difficulties and troubles in crossing Africa. I did my work, as I said after I came back, honestly, and I believe it; but I should never have got across Africa if it had not been for the way in which he fought my battle when I was away. We have all listened with the greatest possible interest to his address, and I congratulate the Society on now having as a President a scientific geographer, neither looking to the right hand nor to the left hand, but to the interest of the Society. I wish to render to you to-night, Mr. President, my most sincere thanks for all you have done for me, and on behalf of the whole of the Society for what you have done for us.

The PRESIDENT: I have to thank Sir Leopold McClintock and Capt. Cameron for the kind words they have spoken of me, and the meeting for the way they have received them. I have to announce that at our next meeting we shall have a most interesting paper on the results to be derived from Antarctic explorations, by Dr. Murray of the *Challenger*.

GEOGRAPHICAL RESULTS OF THE ANGLO-PORTUGUESE DELIMITATION COMMISSION IN SOUTH-EAST AFRICA, 1892.*

By Major J. J. LEVERSON, R.E.

THE country surveyed by the Anglo-Portuguese Delimitation Commission in 1892 consists of a narrow strip of territory extending south for about 140 miles from the sources of the Gaeresi River (Zambesi Basin), situated in about lat. 18° S., and then S.S.W. to a point described in Article II. of the Anglo-Portuguese Convention of June 11th, 1891, as the north-eastern point of the frontier of the South African Republic. This point is situated at the junction of the Rivers Limpopo and Unvubu in latitude about 22° 25′ 32″ S.

* Map, p. 576.

With the exception of the bush-covered plateau between the Rivers Sabi and Limpopo, the country is generally very mountainous, and is traversed by innumerable streams of excellent water, belonging to the basins of the Zambesi, the Pungwe, the Busi, the Sabi, and the Limpopo, all of which flow into the Mozambique Channel.

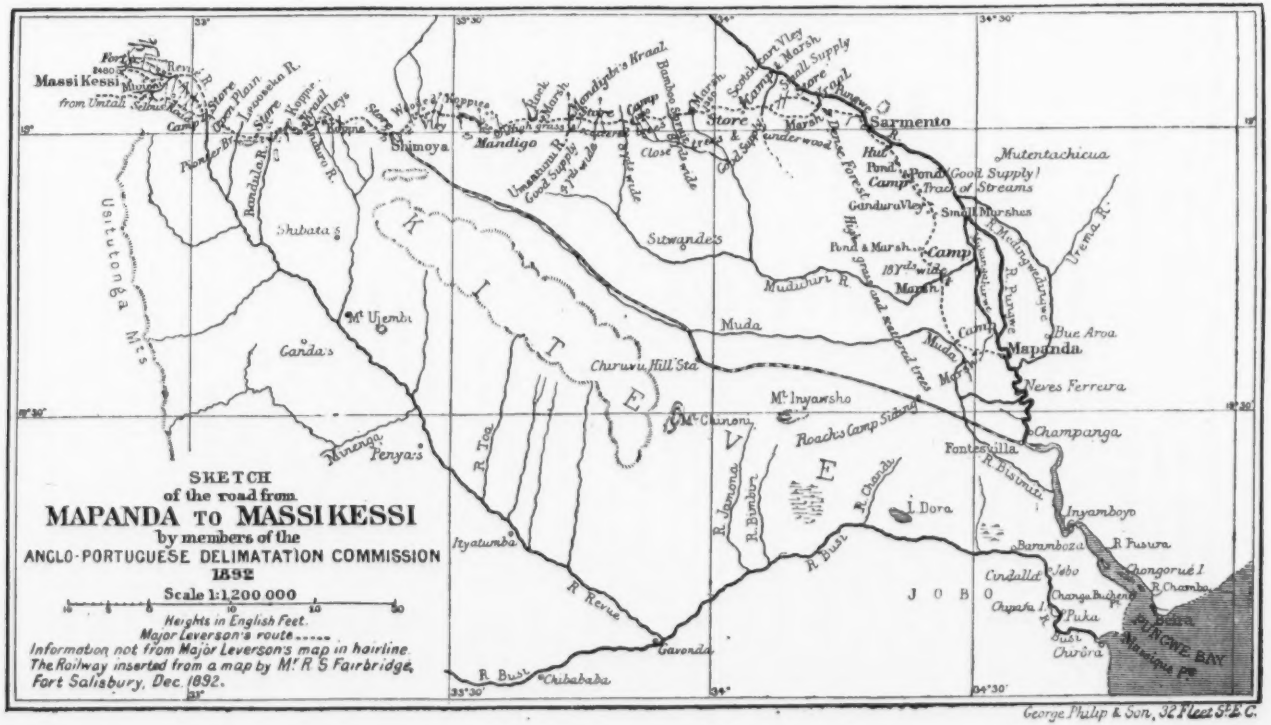
The basin of the Pungwe is bounded on the north by the watershed separating it from the Zambesi basin, on the south by that separating it from the Busi basin, and on the west by the Sabi basin. The main stream of the Pungwe rises in the Inhangani Mountains, many of the peaks of which are between 6000 and 7000 feet high, and runs generally in a south-easterly direction to the sea. Within the limits of the survey it may be described as a rapid mountain river, but east of long. 33° E. it enters a flat country covered with thick forest, the monotony of which is relieved here and there by small isolated mountains and koppies with steep slopes which stand out abruptly from the plain.

At a ford almost due north of Mount Zaramira, where the Commission crossed the river at the end of October, the water was about 3 feet deep, with a strong current and stony bottom. The general width where not cut up by islands was from 30 to 40 yards. There were numerous deep pools in which hippopotami were plentiful. After rain the Pungwe rises very rapidly, and a portion of the Commission when returning from the north to Massi-Kessi in the middle of November, was delayed twenty-four hours on its northern bank, and only succeeded in crossing eventually with great difficulty.

At Sarmento in May it varied from 100 to 200 yards across, and was flowing in a broad sandy bed. In March and April vessels drawing 3 to 4 feet of water can ascend as far as this, but during the dry season of the year navigation ceases above Mapanda's for all boats except native canoes.

Between Sarmento and the sea the river winds its way through an almost dead-level alluvial plain, gradually increasing in width, and in its lower reaches resembling rather an estuary of the sea than a river. Near the sea the banks are very swampy and overgrown with white mangrove. After the rains a large portion of the alluvial plain is inundated, usually to a depth of 1½ to 2 feet. The tide rushes up as far as Mapanda's in a tidal wave or bore. Navigation is very difficult owing to the numerous and constantly-shifting sand-banks. Below Mapanda's few hippopotami are to be seen, but the river is infested by crocodiles in great numbers. Large game is plentiful along the banks.

West of long. 33° E. the left bank tributaries of the Pungwe are mere mountain torrents; on the right bank the most important tributary is the Honde, which rises in the mountains not very far from Umtasa's kraal, and flows through a densely-wooded valley. Some miles above its junction with the Pungwe it is joined by the Inyamkarara. Both the Honde and the Inyamkarara contain many deep pools, but are


SKETCH
of the road from
MAPANDA TO MASSI KESSI
by members of the
ANGLO-PORTUGUESE DELIMATATION COMMISSION
1892
Scale 1:1,200 000
Heights in English Feet.
Major Leverson's route
Information not from Major Leverson's map in hairline.
The Railway inserted from a map by Mr R S Fairbridge,
Fort Salisbury, Dec. 1892.
Massi Kessi
Sarmento
Mapanda
Mandigo
Shimoya
Mutentachicua
Champanga
Inyamboyo
Chindalla
Chongoruè I
PRINCIPE BAY
Mt Inyansho
Mt Chinoni
Mt Ujemba
Churuvu Hill Sta
Roads Camp Siding
Fontesilla
Neves Ferreira
Blue Arva
Muda
Mudurari R
Ituatumba
Gavonda
R Revue
R Busi
R Tao
R Bembire
R Chanda
R Pusura
R Chambo
I Dora
JOBO
Usutungwa Mts
Kalile
George Philip & Son, 32 Fleet St E.C.

fordable in places. We crossed both rivers due south of Mount Zaramita on October 27th. My notes regarding the fords are as follows:—*Inyamkarara:* Strong current, stony bottom, 2 feet deep, 20 yards broad. *Honde:* 2½ feet deep, 25 yards broad, slight current, sandy bottom.

On the march from Mapanda's to Massi-Kessi the most important tributaries of the Pungwe met with are the Muda, which, under the name of Bigamiti, flows into it some distance below the railway terminus at Fontesvilla, and the Mudichiri, which flows into it between Mapanda's and Sarmento. In May the Mudichiri at the drift by which we crossed was about 2 feet deep and 30 yards broad, with a one-knot current. In November the volume of water had diminished very considerably.

The portion of the Busi basin included within the operations of the Delimitation Commission extends from about lat. 18° 50′ S. to lat. 21° S. The most important north bank tributaries are the Revue and the Lusitu Rivers, and on the south the Umswilizi River. The Busi proper rises in the table-land north of Mapungane's kraals, and flows generally in a south-easterly direction to its junction with the Umswilizi, after which it makes a sharp bend to the north-east. Where crossed by the Delimitation Commission it had not assumed any large proportions. In August at a drift a little above its junction with the Nyamahumba it was only 2½ feet deep and 15 yards broad.

The Revue rises in the mountains between Massi-Kessi and Umtasa's kraal, and flows eastward past the old fort of Massi-Kessi, which has now been converted into the Mozambique Company's headquarter offices in Manica. The new township of Andrade is situated on the Zambusi, a small tributary of the Revue. The Selous waggon-road from Shimoya's to Umtali runs up the valley of the Menini, another tributary of the Revue. At the drift where this road crosses the Revue about 14 miles below Massi-Kessi, the stream was in May last about 2 feet deep and 40 yards broad, with a rapid current. In November the water had diminished very much, and was only about 30 yards broad and 1½ feet deep. During the rains the river becomes impassable, and crocodiles are said to be numerous.

The streams rising in the Udza Mountains between Mount Vumba and the Chimanimani Pass flow generally eastwards, and find their way eventually into the Revue.

Just north of the Chimanimani Mountains the Great Musapa River flows through a narrow, rocky gorge, enclosed on both sides by towering cliffs. On most maps this river is shown as a tributary of the Lusitu, but whether this is correct, or whether it joins the Revue, or flows direct into the Busi, we had no opportunity of ascertaining.

The Lusitu River, within the limits of our work, was an important stream flowing in a deep valley, the mountains on its northern or left bank rising steeply to a height of several thousand feet above it. On

the right bank the country was less mountainous and was covered with luxuriant tropical vegetation, in which clearances had been made here and there for the cultivation of mealies and other kinds of grain. Fish were plentiful in the river. The stream varied from about 25 to 40 yards in breadth, and at the ford where we crossed in July was about 3 feet deep.

The Harom River, a fierce mountain torrent which runs southwards along the foot of the craggy and precipitous western ridge of the Chimanimani Range, flows into the Lusitu some miles below the ford.

VIEW OF THE LUSITU RIVER.

We succeeded in exploring the greater portion of the Umswilizi, and ascertained that the somewhat remarkable circular course of this river shown on most maps hitherto published in dotted lines is pretty nearly correct. At the drift near Mahash's kraal the stream was in August about 20 yards broad and 2½ feet deep. From this point to its junction with the Busi it flows through a slightly undulating country, shut in on the north by the low mountains which separate it from the Sheneyka, but to the south the country is open as far as the eye can reach.

Nearly the whole of the upper course of the Umswilizi is through

a mountain gorge, from which it emerges a little above the above-mentioned drift. This gorge is in some places narrow, while in others it widens out considerably, and affords room for native villages and fields of mealies, Kaffir corn, etc., along the river-banks. The slopes of the mountains enclosing the gorge are for the most part covered with thick forest. The river itself consists generally of a series of long, almost still reaches connected by rapids. The scenery within the gorge is everywhere very beautiful.

South of the Umswilizi the character of the country soon changes; it becomes much less mountainous, drier, and more sandy. The Mlongezi is a small sluggish stream flowing into the Umswilizi. Its valley constitutes the southernmost portion of the Busi basin. Beyond this a gently undulating district covered with grass and stunted trees forms the watershed between the basins of the Busi and the Sabi.

At the point where we struck the Sabi, about 4 miles above its junction with the Lundi, it had just emerged from a mountain gorge and entered the great plain through which it finds its way to the sea. It was flowing in a broad sandy bed from $\frac{1}{4}$ to $\frac{3}{4}$ mile broad, the actual width of the stream, however, in August and September being only from 50 to 100 yards. The water was about $2\frac{1}{2}$ feet deep with a slight current. The bottom was sand and small gravel. A little way up the gorge we discovered an important series of cataracts and rapids, which, it is believed, are not marked on any map hitherto published. Their origin appears to be due to the intrusion of a broad dyke of porphyry through which the river has had to force a channel. The bed of the cataracts is of solid rock about 100 yards wide, with deep, narrow tortuous channels cut in it through which the water flows in the dry season. During the rains the whole space between the almost vertical cliffs, from 100 to 150 feet high, which form the sides of the gorge, must be a terrific roaring torrent. Wherever waterworn the rock has a highly polished surface, and is of a deep red-brown colour. The scenery in the neighbourhood of the cataracts is very grand and weird. The site is somewhat difficult of access, and the Commission had unfortunately not sufficient time to make a thorough examination of them, nor to determine their total height or length.

The characteristics of the Lundi are very similar to those of the Sabi. At the point where we crossed, it flowed in a bed of very heavy sand about $\frac{1}{4}$ mile broad, the actual stream, however, being only about 40 yards broad and 2 feet deep. Near its junction with the Sabi it becomes much narrower, but is 5 to 6 feet deep. Much of the water brought down by both rivers doubtless percolates through the sand, and is not visible to the eye. The natives as a rule do not take their drinking-water direct from the streams, but from holes which they dig in the sand, and which fill rapidly with water to the level of the surface of the

FALLS AND RAPIDS OF THE SABI RIVER SIX MILES ABOVE ITS JUNCTION WITH THE LUNDI.

river. Numbers of wild geese are to be seen along the river. Fish is very plentiful, and is usually caught by the natives by spearing. There are also hippopotami and crocodiles.

Between the Lundi and the Limpopo, locally called the Umiti, we did not see any streams of running water (September), though we crossed several sand rivers in which water was obtainable either in small reedy pools, or by digging holes to a depth of 4 to 5 feet. The principal of these were the Chefu and the Nuanetsi, both of which eventually join the Limpopo.

These sand rivers are rather a remarkable feature, and vary in breadth from a few yards to more than a quarter of a mile (Nuanetsi). Their surface is nearly level, and consists generally of heavy sand, though occasionally there is some gravel. The banks are well defined, usually from 6 to 10 feet high, and are fringed with fine tall trees and fresh green foliage, very different from the dark-coloured thirsty-looking, stunted bush with which the country between the water-courses is mostly covered. For a short while during and after the rain I was informed that there is running water in some of these sand-rivers, but the total rainfall in this district is very small.

The Limpopo near its junction with the Unvubu (Pafuri) flows through a nearly level alluvial plain about 6 miles broad, enclosed by the scarps of a plateau which rises some hundred feet above it. Close to the river-banks there is a belt of luxuriant forest varying from a few yards to a mile in width, in which a tall, graceful acacia, with a light green bark and yellow blossoms exhaling a most fragrant perfume, is the most conspicuous tree. Where we crossed the river it flowed in a sandy bed altogether about $\frac{3}{4}$ mile broad, in two principal streams, one near the left bank and the other near the right bank. The total breadth of water crossed was about 200 yards, its depth 1 to $1\frac{1}{2}$ feet, and the current 1 to $1\frac{1}{2}$ knots (September). At this ford much of the water must percolate through the sand, as a little lower down the visible volume of water was much greater.

The Unvubu is a pretty stream 40 to 50 yards broad, running between well-defined beautifully-wooded banks. At its junction with the Limpopo there is a deep pool teeming with fish, and containing some crocodiles.

In the district immediately north of Massi-Kessi, which is the meeting-place of the hydrographical basins of the Pungwe, the Busi, and the Sabi, many of the mountains rise to a height of between 6000 and 7000 feet. The most important of them is the great mass of Panga (6970 feet) with its many peaks, enclosing the valley of the Inyamkarara on the west. To the east this valley is shut in by the precipitous slopes of Gorongoe, which culminate in a remarkable sugar-loaf peak 5690 feet high. Lunji (5960 feet) is also a well-defined peak, rising sharply in the shape of a slanting pyramid from a very high

plateau. Mount Doe has a grass-covered dome-shaped peak (6725 feet), but is so surrounded by high ground that it is not much noticed.

The Mahemasemika ridge on the northern side of the Honde River, when seen from the east or west, has a very curious broken and castellated-looking crest-line. At the southern end of it there is a granite pinnacle standing out like a gigantic Cleopatra's Needle.

Mount Zaramira is a sharp-peaked isolated mountain separating the main stream of the Pungwe from the Honde.

North of the Honde River is a very high tableland which includes the Inhangani and the Unyamahomu Mountains. Here the basins of the Pungwe, the Sabi, and the Zambesi all meet.

Looking north from the end of a spur above the Gaeresi, the furthest point reached by the Commission, the country continues excessively mountainous as far as the eye can see. To the north-east and east the mountains soon disappear.

Mount Venga, just north of Massi-Kessi, and a few other peaks are covered with trees to their summits, but the greater portion of the very high ground is grass land, while the valleys, except that of the Revue, and the plains are nearly everywhere covered with forest.

Among the passes on the most frequented routes north of Massi-Kessi the following may be mentioned:—

1. From the Chua valley (Busi basin) to that of the Inyamkarara (Pungwe basin) 4360 feet.

2. From Musawigombe's kraal, west of Mount Tangwe (Pungwe basin), into the valley of the Unjorla, a tributary of the Gaeresi (Zambesi basin) 4700 feet.

3. From the Honde Valley across the watershed between the basins of the Pungwe and the Sabi on the road to Umtasa's kraal, 5260 feet.

4. On the old footpath from Massi-Kessi by the Zambusi Valley (Busi basin) to Umtali (Sabi basin), 4510 feet.

Between Massi-Kessi and the Musapa River the mountains consist of the Udza range, which forms the watershed between the basins of the Busi and the Sabi, and of short ranges running east from the watershed, enclosing narrow valleys between them. Most of these short ranges end somewhat abruptly just west of the road along which the Commission marched. Mount Vumba (4950 feet), at the eastern end of the range running south of the Menini River, with high, precipitous cliffs on its eastern and southern sides, is a conspicuous feature in the landscape, and can be seen from great distances.

Between the Musapa River and the Lusitu the country continues very mountainous. The pass commonly called the Chimanimani Pass, by which the Commission crossed from the Musapa Valley to that of the Great Musapa, is about 5130 feet above the level of the sea.

East of the Harom River is the great mass of the Chimanimani

Mountains, a limestone formation, with sharp peaks, serrated crest-lines, and almost perpendicular bare slopes, totally different in appearance from the grass or forest-covered slopes and peaks of the rest of the country. The highest peaks of the Chimanimani Mountains exceed 7000 feet in height.

South of the Lusitu the country is still very much cut up, but the mountains gradually diminish in height and trend away to the south-west, disappearing almost altogether along the route which we followed from the Umswilizi to the Sabi.

Between the Sabi and the Limpopo we did not see any mountains of importance, the country being generally a nearly level bush-covered plateau.

To give some further idea of the general level of the country it may be mentioned that the height of the new township of Andrade (Massi-Kessi) is about 2500 feet above the sea; that the road thence to the foot of the Chimanimani Pass varies from about 2000 to 3000 feet above the sea; and that the drifts at which the Commission crossed the Lusitu, the Sabi, and the Limpopo, were respectively about 1300 feet, 540 feet, and 600 feet above the sea.

North of the Sabi the forests with which the plains and valleys are covered consist principally of mopane (acacia) trees and wild loquats. The fruit of the latter, which is ripe by the middle of October, has a very delicate aromatic flavour, and is eaten in large quantities both by Europeans and natives. In the country north of the Revue there are in places great numbers of bamboos.

On the march up from the coast to Massi-Kessi we passed a good many palms in the plain which stretches from Mapanda's to Sarmento, These were principally of two kinds—a stunted nut-palm, and a diminutive date-palm. Elsewhere, except in the valley of the Limpopo, palms were comparatively rare. The palm of the Limpopo produces a wine which, when fresh, has a very pleasant flavour, something between ginger-beer and cider.

In one of the small valleys immediately north of Massi-Kessi there are great numbers of fern-palms.

The Kaffir orange is met with pretty generally throughout the country. The fruit is contained in a hard, green, spherical shell, the interior when ripe being somewhat like a medlar with rather a sickly taste.

Between the Sabi and the Limpopo a fruit is found which, as far as I am aware, seems to be almost unknown elsewhere. In the absence of grain of any kind, owing to the failure of the crops from want of rain in the spring of 1892, it was in use as the staple article of diet of the native population of this ill-favoured district. In outward appearance the fruit is a hard, green, spherical shell, very like the Kaffir orange. The inside consists of a number of brilliant yellow balls with

large stones, something like small plums. To prepare them for food, they are taken out of the shell and steeped for a long while in the water-holes of the river-beds. They are then sun-dried, and subsequently, the stones having been removed, ground into a kind of meal, which has an objectionable smell, reminding one of that of a tan-yard.

Along the Sabi and the Limpopo there are great numbers of huge baobab trees. The interior of the fruit of this tree, commonly called the cream of tartar fruit, is very pleasant to the taste. The tall, graceful acacias with light green bark, which are found along the banks of the Limpopo, have already been alluded to. Large quantities of gum exude from the stems of these trees, and it is not improbable that its collection might prove a profitable industry.

The products of the soil cultivated by the natives, include bananas, the castor-oil plant, with hedges of which some of the villages are surrounded, Chili peppers, a very favourite condiment of the natives, tomatoes, sweet potatoes, ground nuts, mealies, Kaffir corn and various kinds of other native grain, the most abundant of which is the red oofoo, tobacco, and non-poisonous manioc. Rice is said to be largely grown in Mashonaland, and to be of excellent quality, but there was very little of it to be seen in the frontier districts traversed by the Commission.

A very noticeable difference between the vegetation of the eastern portion of South Africa and that of the western, is, that whereas in Bechuanaland thorns, often of great size, are almost universal on all trees and bushes, in the country surveyed by the Commission, with the exception of an occasional "wait-a-bit," very few thorns were met with. On the plains and in the valleys after the rains the grass grows to a height of 6 to 10 feet. It decreases in size somewhat with the altitude, and on the tops of the high mountains rarely exceeds 6 feet. This grass not only impedes locomotion, but prevents hunting. In consequence of this as soon as it is dry enough it is burned down. For about two months great veld fires, stretching for miles and miles, and extending to the tops of the mountains, are to be seen in all directions. During this period the atmosphere is usually somewhat thickened by the smoke from these fires.

The distribution of the native population varied much in different parts of the country. Journeying south from Massi-Kessi it is very sparse as far as the Chimanimani Mountains. More than three or four huts are seldom met with together, and these are of the most wretched description. Very little is obtainable in the way of food supplies. The natives have no cattle, and appear to live in dread of a raid by Gungunyane. The women wear a stud in the upper lip, which makes it project in the most hideous fashion.

In the valley of the Great Musapa there is more cultivation. The most-thickly inhabited and prosperous part of the country, however, which we passed through, lies between the Lusitu and the Umswilizi

Rivers. Here the villages are larger, the huts are much better built, there is more cultivation, and large numbers of fowls are reared; there is altogether an air of well-being and comfort.

Gungunyane appears to be acknowledged as the suzerain, but many of the minor chiefs, such as Sechagwa, Mafussi, Shekwanda, Mapungane, etc., are of some importance. Mapungane has some cattle which thrives well on the high plateau on which his main kraal is situated.

South of the Umswilizi the country becomes less fertile and the population again diminishes. Between the Sabi and the Limpopo, owing to the scarcity of water, the smallness of the rainfall and the unproductiveness of the soil, there are very few inhabitants, and these lead a precarious existence. On the return march from the Limpopo to the Sabi, between Luatlatla and the Mahunje (67 miles), we did not see a single hut.

North of Massi-Kessi as far as the Inhangani Mountains, the natives all acknowledge Umtasa as their chief. Cattle are to be seen on the high ground in which the Cho-odzani and Umtali streams rise, but not in any of the valleys of the Pungwe basin, except in those of the Revue and Menini, into which they have recently been imported by Europeans. There are no tsetse fly in these valleys, and attacks by lions and other wild animals appear to be the greatest danger to which the cattle are exposed.

In the valley of the Gaeresi Makombe is acknowledged as chief, but he never visits the country, and the inhabitants know little about him. Umtasa's chief kraal is a large agglomeration of huts at the foot of a nearly vertical cliff. It is in a situation very difficult of access, except from the east, and even on approaching from that direction the huge boulders scattered over the ground would make its defence comparatively easy. The most remarkable kraal that we saw was one on the road from the Honde Valley to Umtasa's, just after crossing the watershed. Here the huts were built on narrow ledges of rock on a precipitous cliff, the top of the roof of one hut being on a level with the floor of the one immediately above it.

All the way from Mount Vumba, a few miles south of Massi-Kessi, to the Limpopo, we did not meet a single white person. Near Gungunyane's old kraal on the Umswilizi there is the residence of a Portuguese half-caste, who is the local sub-agent of the Portuguese Resident at Gungunyane's. North of Massi-Kessi we found two prospectors in the upper valley of the Inyamkarara, but, with this exception, we saw no white man on our march to the Gaeresi.

We did not anywhere meet with any hostility from the natives, but in some places they were at first frightened of us. After becoming assured that we had no intention of harming them, and seeing that we paid liberally for all services rendered (guides, porters, etc.), and for all the supplies which they brought in, they were usually most

friendly. But few of them were armed with muskets. They always carried assegais, and in addition to this usually bows and poisoned arrows. Skins are largely used as articles of dress.

The native hoe is the only implement of agriculture in use, ploughs being quite unknown. Meal is prepared by first crushing the grain by means of heavy wooden rammers in hollowed-out wooden blocks, and then grinding it by hand between two stones. This work is done entirely by women. Tea and coffee are unknown beverages. Water is the usual drink, but for special occasions beer is brewed from Kaffir corn. Salt is not considered an indispensable article of diet, but is much appreciated wherever it is to be had. Near the Limpopo it is obtained from some saline earths. The process of extraction is as follows:—The earth is dug out of the ground, and then saturated with water to dissolve the salt. The brine thus formed is run off into earthenware jars, and subsequently heated over a fire in shallow dishes, when the water evaporates leaving the salt behind.

No iron was obtained from the country through which we passed, but in some of the villages we saw small native forges with bellows in which bits of old iron were manufactured into assegai and arrow-heads.

Fire-sticks are still used to make fire, the sticks consisting of a straight pointed one of hard wood, and another about two-thirds of an inch in diameter with a very dry pith. The latter is laid horizontally on the ground and held in position by the foot, while the former is placed vertically on it point downward, and is worked rapidly round and round between the hands, downward pressure being applied at the same time. A hole is thus made in the soft stick, and the pith begins to smoulder. By blowing on it and adding a little fine and very dry straw a flame is soon obtained.

With the exception of the Selous Road from Shimoya's to Umtali, two branches from it to Massi-Kessi, and a road made by the Delimitation Commission from Massi-Kessi to a point about 40 miles south, no waggon roads at all exist in the district traversed. The native paths wind about to a most unnecessary and exasperating extent. It is, however, as a rule advisable to keep to them even when the bush is not thick, instead of attempting to march straight across country, for the grass roots are so strong and sharp that they hurt the bare feet of the native porters. Natives always march in Indian file and cross their feet. As a result of this the paths are excessively narrow, and walking on them is most uncomfortable for Europeans.

When proceeding up-country from the Pungwe we did not get clear of the tsetse fly till we reached Shimoya's. Thence to Massi-Kessi ox-waggons brought down from Mashonaland were able to work along the road. South of Massi-Kessi, the only place in which we came across the fly was in the neighbourhood of the Sabi. Five ponies which we took with us from Natal all died, or had to be shot within six weeks of

their landing at Beira. We also lost from fly-bite every one of twelve oxen which made the journey from Shimoya's to Mandigo's and back, a section of the Beira Massi-Kessi road, which till the commencement of 1892 was believed to be free from fly. Even when there is no fly horses are apt to succumb, for they have another deadly enemy to contend with in the mysterious "horse-sickness," so prevalent in many parts of South Africa, and none but salted horses should be used. The grass is usually so coarse as to be bad feeding, and the great difficulty, if one has horses, is to get sufficient mealies for their requirements.

The great coast plain between Beira and Sarmento teems with large game. The varieties met with in greatest numbers are the buffalo, water-buck (peevah), quagga, and hartebeest. There are said to be still some elephants within a comparatively short distance of Mapanda's. On the march from Massi-Kessi to the south most game was seen between the Chimanimani Pass and the Umswilizi River. It included eland, buffalo, hartebeest, wildebeest, bush-buck, reed-buck, quagga, sable antelope, blue buck, red antelope, and wild boar. Between the Limpopo and the Sabi we came across the spoor of giraffe, but did not see any of the animals. Hippopotami were found in the Pungwe, and its tributary the Honde, and also in the Umswilizi and the Sabi. Of edible birds those most frequently seen were the guinea-fowl and varieties of the dove, which were generally to be found in the vicinity of growing crops. Near the Sabi a hooded guinea-fowl was shot. Water-fowl, including wild geese and duck, are numerous on the Sabi, the Lundi and the Limpopo.

The wild animals met with included lions, leopards, commonly called tigers, hyænas, tiger cats, and jackals. The presence of crocodiles in the rivers has already been alluded to.

Snakes were much less numerous than had been anticipated. No accident from snake-bite happened to any member of the Delimitation Commission, either European or native (total strength nearly two hundred), during the whole seven months it was in the country. The only snakes that I saw personally were some puff adders, and a long snake of very small girth, the name of which I was not able to ascertain.

THE LIMITS BETWEEN GEOLOGY AND PHYSICAL GEOGRAPHY.

A DISCUSSION on the relation between Geology and Physical Geography took place between Sections C (Geology), and E (Geography), of the British Association at Nottingham, on Friday, September 15th, in the meeting-room of Section E. By the permission of the presidents of both sections, the chair was taken by Sir Archibald Geikie, F.R.S., who

said that he consented to preside in the hope that the meeting might be able to evolve from the discussion some clear conception of the mutual relations of Geography and Geology.

Mr. Clements R. Markham, C.B., F.R.S., President of the Royal Geographical Society, opened the discussion by reading the following paper:—

Knowledge is one, and its division into what we call sciences is necessary, because no human being was ever so gifted as to grasp it as a whole, and also to acquire a special acquaintance with all its parts. A division of labour is inevitable, and the bounds of each division must be more or less arbitrary. At the same time there is no reason why those limits should not be fixed by common agreement, and upon grounds that would receive assent from expert and intelligent criticism.

In considering the boundary-line between geology and physical geography, I approach the subject as a geographer, and I look at it from a geographical point of view; but if my conclusions are in the main correct, they will be accepted by geologists because, although our points of vision are not the same, the impressions we receive are caused by identical phenomena. From a central geographical position I believe that the limits of our science may be defined; distinguishing between the subjects which are within our boundary, and those which, although clearly belonging to another division of knowledge, are still pertinent to our enquiries.

I have no doubt of the utility of such definitions. While each seeker after knowledge should work within the defined limits of his own special science, it should also be his aim to generalise and to bring out its relations with other spheres of enquiry. In both lines of study and of thought he will receive assistance from clear and acknowledged definitions of the scope of each science; for he will thus find guidance with regard alike to the methods and to the extent of his researches.

Geography was the first science, the mother of all the sciences, the astronomy of the ancients being mainly mathematical geography. With the ancients as with us the work of geographers was to measure all parts of the Earth and sea, and to fix the relative positions of all places on the Earth's surface. Locality is the basis upon which nearly all human knowledge rests, and it is one of the priceless gifts which geography supplies to her daughter sciences. We first establish the locality, and then we study the phenomena within a given area, and the changes which have taken place during historical times, that is, the changes respecting which there is human testimony in some shape or form, not necessarily written testimony. These changes generally explain to us the laws according to which similar changes are now taking place around us. This is physical geography. From the point of view of its connection with physical geography, I take geology to be a study of the condition of the Earth, and of the changes that have

taken place on its surface during the cycles of ages previous to the dawn of history. Sir Roderick Murchison used to say that the geologist was the physical geographer of former periods. When he studies the phenomena of physical geography it is to collect data which will enable him to solve some problem of remote ages. The geologist and the geographer use the same materials but for different purposes; the former to find interpretations of problems relating to the past, the latter to explain what is actually taking place in the present.

There is thus a definite boundary between the two sciences, although, as we have seen, each has occasion to use arguments derived from the other, in order to find interpretations or explanations for its own problems.

The physical geographer certainly has to learn from geology the influence that the nature of the various rocks and their present positions has had, and still has on the features of the Earth's surface as we now see them. For instance, the causes which decide the direction of river-beds can generally be ascertained by a study of the nature of the rocks, and of their inclinations round the fountains and along the river-courses. But the objects of such study are different from those of the geologist; and no geological facts or arguments come within the sphere of the geographer's work unless they help to explain an existing feature. The aid derived by the closely allied sciences from each other does not interfere with the enunciation of a distinct limit between them. I believe this boundary-line is to be found where human testimony ceases. Geography fixes localities. It finds certain physical phenomena peculiar to each locality and it seeks for their causes. In such research the two sciences of geology and geography are on common ground; but while the object of the former is to obtain explanations of phenomena in the remote past, that of the latter is to seek reasons, from the testimony of history, for the condition of the locality as the geographer sees it before him. Generally such human testimony is sufficient for his purpose. When it is not, he seeks for explanations within the domains of geology, of biology, of meteorology, sometimes even of astronomy; but such necessity to go further afield does not vitiate the accuracy of a definition which sets proper limits to his own science. It merely reminds him of the great truth that knowledge is one, that it is one harmonious whole, and that the divisions into special sciences are the inevitable consequence of the limits which circumscribe the powers of the human mind. Humanity must acknowledge to itself that as knowledge extends, these limits become more evident, and sub-divisions become more urgent. In common with other sciences, geography finds the necessity for specialism, while the sub-divisions within itself render clear definitions of its outer limits more desirable and more useful.

My own studies have been chiefly in the direction of comparative geography, and I have sought for the explanation of existing conditions

of the Earth's surface by examining the records of former centuries. On one hand, such special studies lead to an appreciation of the necessary connection between physical and political geography: of the fact that a consideration of the influence of the configuration of the surface, of climate, and of products must form the basis of a study of the history of man. On the other hand, they furnish explanations of the existing condition of the surface, and suggest that definition of the boundary between geology and geography which I now submit.

In order to test the application of a canon intended to define the boundary line of the two sciences, it will be well to select some given area for the purpose. The great valleys of the Ganges and the Indus will be suitable. If we go back to the earliest human records, we shall find that the chief centre of power was on the water-parting between the Jumna and the Sutlej. All the rest of the present valley of the Ganges was then less suitable for settlement. The vast region between Delhi and Calcutta has become populous within the historical period. As dynasty succeeded dynasty, we find the foundation of cities recorded in situations lower and lower down the valley. The physical geographer compares the records of history with what he can now see with his own eyes. The process that is going on is described by Mr. H. F. Blanford. Standing on the banks of the Ganges, and watching the turbid flood swirling past, the observer sees the *chur* opposite, which the river left dry when its waters fell at the close of the last rainy season. Until lately it was covered by a rich green crop of indigo. It is now more than half cut away and buried beneath the waters. Huge masses detach themselves from time to time and are swallowed up by the deep muddy stream. These are present facts. The enquirer then learns that half a century ago the river itself was only a moderate-sized *khall*, and that an old channel, 7 or 8 miles off, and now little more than a string of pools, was at that time a great river. Turning to history, he will find that the ancient records of the people gradually unfold the causes and effects of what he has seen and heard. The positions of the capitals of the different dynasties which successively reigned in the valley plainly continue the story, until the Vedas are reached. Then the whole wonderful record is unfolded through the help of human testimony. It is all within the domain of geography, up to the causes which led to the disappearance of the Saraswati and to the alterations of the courses of the Sutlej and the Jumna. The more remote record represented by the mountains bordering on the valley, by the Sawalakh hills and their fossils belongs to geology. Here the reasons for drawing the boundary line between the two sciences stand out clearly defined. All that comes within the ken of human testimony belongs to geography; the earlier pages contain the changes indicated by positions of strata, and the story told by the Sawalakh fossils, and are a part of the science of geology.

If we come nearer home we see how the remarkable phenomena connected with the long battle between the land and the sea, at the delta of the Rhine, teaches another memorable lesson in physical geography, with the aid of history. We see what is going on now, the dunes protecting Holland from destruction, the Zuyder Zee, the numerous islands, and the tracts of reclaimed land. Human testimony explains the causes which produced the present condition of this region, and the gradual changes in the course of centuries. The slow movement of the dunes is revealed to us by the statue and temple of Nehelennia, which was uncovered some years ago on the Domburg Sands. A drive of 12 miles northwards from Bruges conducts the enquirer to the little country town of Sluys, which is surrounded as far as the eye can reach with cornfields and meadows, and clumps of tall trees. The student of Froissart reads how our King Edward III. gained a great naval victory over the French fleet on this very spot. If he continues his researches and studies the narratives of the great struggle between the United Provinces and Philip II. of Spain, he will find that a change had slowly but surely been taking place. Sluys is still a port, but with very different surroundings from the Sluys of the 14th century. From that time he may trace its story, with the aid of a succession of maps, down to the present day. This is physical geography, explained and illustrated by the aid of history. The earlier record of the same region when the mouth of the Rhine was somewhere in the latitude of the Orkneys, and the river-drift men tenanted what was then a part of a continent—but is now the Island of Britain, as distinctly belongs to geology. The interesting facts connected with it are not ascertained by human testimony, but by other methods and for other objects. Here again we find a natural boundary-line between geology and geography, by means of which the whole body of facts relating to a locality can be logically divided between the two sciences, and conveniently classified.

History, as well as the voyages and travels of former explorers, teaches many a fact of the greatest interest to the physical geographer. At the Pass of Thermopylæ he can study the topography of the Persian campaign, and fix the spot where Leonidas made his final stand; while at the same time he can trace the progress of the extensive changes in that region down to the present day. On the rock of Mont St. Michel he can watch the progress of the high tides until the place where he stands is converted into an island. History tells him that this mount, a college of Druidesses and later a temple of Jupiter, was in the centre of a great forest, the *Setiacum nemus*, in Roman times. Here, in this very county, the native of Nottingham may descend his own river of Trent, and come to a great cultivated district which was once Hatfield Chase, a wild tract of forest and moor, intersected by water-courses and dotted with large pools and swamps. The tomb at York

Minster tells us that young Prince William, the son of Edward III., met his death in Hatfield Chase; he caught an ague when his father was hunting deer, from a boat, in the marshes. In this instance the change is due to human agency, but that change is equally a part of physical geography, and the geographer traces its progress through the study of historical documents. Still more important changes have been caused in the countries bordering on the Mediterranean, partly through meteorological agents and partly through the work of man. In many places the cactus and the aloe have usurped the ground occupied in classic times by forests of oak and beech. We know, from the evidence of historical documents, that the mountains bordering on the garden of Murcia in Spain, which are now naked rocks rising in peaks and ridges, were once, and not longer ago than in the days of Alfonso the Wise, clothed to their summits with pine-woods.

It is thus that physical geography finds most efficient assistance from human testimony for the study of the former state of parts of the Earth's surface, at different epochs, which led to their present condition. It need not always be written testimony. The splendid temples of Selinunte on the south coast of Sicily, and the direction in which they have been thrown down, are the silent witnesses to a great earthquake in the eighth century. We have seen, too, how the statue of the goddess Nehelennia explained the direction and rate of movement of the sand-dunes of Zeeland.

It is this testimony respecting the condition of the Earth's surface at long intervals of time which gives such importance to the editing and the study of old voyages and travels. Hence every physical geographer ought to be a member of the Hakluyt Society. By careful reading, and by knowing what he wants, he will pick many a plum out of the heaviest pudding. But, in truth, the quaint old narrators of voyages and travels are very rarely dull. The student of physical geography is sure to be rewarded by their perusal. He may be giving his attention to the formation of coral islands, and perhaps meditating on the question whether Bermuda once formed a great circle of land enclosing a lagoon. The existing evidence is the small west rock on the western reef gradually being reduced in size by the action of the waves. Further evidence of the dimensions of this rock in former times would be important. A man named Henry May went out as a mate with Lancaster in his first voyage to the East Indies, three centuries ago. May lost his ship somewhere near Puerto Rico on his return voyage; and took a passage home in a French vessel. He was shipwrecked on the western reef of Bermuda, and his journal supplies evidence respecting that west rock. He describes that land as consisting in his time of "high cliffs." Further research may reveal its dimensions at some other period, and so help the researches of geographers; for the narrative of Bermudez, the discoverer of this coral group, is still buried in Spanish

archives. Mr. Woodford has mentioned to me how, in the same way, a passage in the journal of an officer serving under Mendaña in 1567, explained to him a change on the coast of Guadalcanar, one of the Solomon Islands.

When the explorer makes new discoveries, their true significance can only be established by the testimony of history. The region round Lake Zuwaya to the south of Abyssinia is almost unknown, and is consequently very interesting to geographers. It was unvisited for centuries, and Mr. Ravenstein, our greatest authority on Africa, has to go back to the enterprises of the Portuguese to find any trace of a visit to it. Thus it is that we appreciate the value of the narrative of Father Alvarez, who accompanied the embassy of Rodrigo da Lima to Prester John; for one of the members of this embassy, in a journey to the southward of Abyssinia, described the lake, which has again been revealed to us by modern travellers after an interval of three centuries.

Instances need not be further multiplied to prove that the alterations of the Earth's surface, which properly engage the attention of the physical geographer, rest upon human testimony—upon history and the records of voyages and travels. What applies to changes caused by the action of water, is equally true of the volcanic irruptions and subterraneous forces to which the surface of the Earth is subject. Some of these phenomena belong wholly to geology, while others have expended themselves in historic times, or are now actually at work. The great volcanic region of Auvergne belongs entirely to geology. Geography is merely concerned with it, with reference to its actual physical aspects, and their relation to existing results. Its formation and history is beyond the domain of human testimony, and, therefore, of physical geography. The irruptions of Vesuvius, on the other hand, are purely geographical, although their study is important to geologists; because the first appearance of activity took place in historic times, and its subsequent action is fully recorded. The same remark applies to the greater part of the mighty volcanic belt of fire from New Zealand to Japan.

Earthquakes compose another series of phenomena which belong to geology or to geography, as they occurred before or after the dawn of human testimony. Seismology is a department of geography, and the record of earthquake phenomena can only be completed by researches into the history of the past. The colonial records, in the Spanish archives, thus enable us to form a descriptive list of the earthquake phenomena on the western coast of South America for the last three centuries; and similar chronological series can be gathered from historical documents as regards several other parts of the world. In all these departments the line between geology and geography can be defined without strain or danger of confusion; and the result of the consideration of the question of limits, from this point of view, seems

to be that it can be settled naturally and without undue concession on either side.

There are doubtless many other considerations which I have overlooked, and which should be marshalled in order, and be given their proper weight. This may be done in the course of a discussion; and the final event may modify or set aside my conclusions. I speak only as a comparative geographer, and from a special standpoint. Geologists may not improbably see the same facts from a different point of view, which will lead them to other conclusions. I believe, however, that such differences will only apply to details, and that a final conclusion may easily be reached by mutual agreement. For we must recollect that, although knowledge is one, the limits of all our divisions of knowledge must inevitably represent a series of compromises.

Meanwhile, and until better instructed, I should define GEOLOGY as the study of the condition of the Earth and of the changes on its surface during the cycles of ages before the dawn of history; and I should define PHYSICAL GEOGRAPHY as a knowledge of the Earth as it is, and of the changes which have taken place on its surface during historical times. These changes, derived from human testimony, explain to us the laws according to which similar changes are now taking place around us.

The two sciences depend upon each other and are very closely allied. The geologist finds the same phenomena in the rock formations of the past as the physical geographer discovers on the surface of the Earth of the present. Both, for example, have the duty laid upon them of seeking out the agencies which rule in the processes of upheaval and depression, as described by Professor Lapworth in his masterly address to the Geological Section of the British Association last year. The fold, with its crest and trough, is common to both sciences; and geographers have rejoiced at Professor Lapworth's announcement of "a wedding-ring of geology and geography uniting them at once and for ever in indissoluble union," while they preserve their separate existences and work out their problems by different methods.

Mr. W. TOPLEY, F.R.S., of the Geological Survey, gave a demonstration, by reference to actual cases, of what he believed to be the relation between geography and geology, and summed up his argument as follows:—

Professor Lapworth in his address to the Geological Section last year at Edinburgh showed clearly the close relationship of geology to physical geography as regards the larger features of the Earth's surface, the structure and distribution of mountain chains, the great folds which traverse the Earth's crust, and the wider areas of uplift and depression. I propose to refer mainly to the minor features of the surface, and to show that the nature and "lie" of the rocks determine these surface

features. From this point of view geology forms the basis of physical geography, and a geographer must necessarily be to some extent a geologist. There is no need to point out that the converse of this is equally true. A geologist who would understand in what way existing geological conditions have been brought about, how strata have been deposited, volcanic rocks erupted, and how denudation has carved the surface into its present shape, must study similar phenomena now in progress.

A comparison of geological and physical maps of any area at once shows that different rock-groups and formations present different types of land; the hills and mountain chains coinciding with the outcrops of certain rocks or strata, whilst other formations are characterised by plains or by low-lands. It is thus clear that the geological structure of any district determines its physical geography. This relation is equally apparent when we compare the structure and surface features in detail. The older masses of rock frequently form mountainous land; the newer palæozoic and the secondary rocks occur mainly on a succession of plains and escarpments, each determined by the outcrop of certain beds.

The history of valleys, plains, and gorges, can only be understood by reference to their geology. We then see why rivers, after for awhile running over wide open plains, suddenly break through hill-ranges, cutting the escarpments at right angles; the explanation being that the streams began their work when the whole formed a comparatively even surface, the existing features being due to long-continued erosion. The escarpments, plains, and transverse river-valleys of Central and Southern England, and of Eastern France, form excellent examples of this structure. Here the geology is simple, a fairly continuous dip in one direction and different beds cropping out from beneath each other, in definite order. On the flanks of mountain chains this simple structure does not hold good; there the beds are frequently contorted, inverted, and thrust over each other, so that a superficial reading of the geology would give erroneous results as to the order of succession. But even here the present "lie" of the beds has determined the physical geography, the disturbances of the rocks having been produced when they were deeply covered by other strata, now removed by denudation. Some igneous rocks weather into conical hills resembling volcanic cones. The same thing often occurs in the weathering of sands, whilst sand is frequently blown into conical and crater-shaped hills. A hasty glance at the outward shape of such hills might mislead a traveller. Many conical hills in the south of Scotland are old volcanic vents, up which molten lava once came; but the true volcanic cones have been long since removed by denudation, and what we now see are only the once deeply seated "necks" of the old volcanoes, the softer strata having been worn away. Caution is necessary in interpreting the apparent *dip* of strata as a means of determining geological structure; besides foldings and

inversions, already referred to, we have to guard against being deceived by cleavage, false bedding, etc. The "fan-shaped" structure of many mountain chains offers a well-marked case of folding and inversion.

A knowledge of the geological structure of certain rocks in any one area may mislead when applied to distant districts. The soft clays, thin limestones, and sandstones of the Jurassic rocks of England, are represented in the south and east of Europe by thick masses of limestone, forming prominent mountain ranges; whilst the soft Triassic rocks of England are represented in the Alpine area by huge masses of limestone and dolomite, with intermediate softer bands, and with layers of volcanic rock. Even within so small an area as England we have differences in lithological composition, making differences in physical geography. The high and barren moorlands of north-east Yorkshire and the fertile districts of the Cotteswold Hills are both composed of Lower Oolitic rocks; in the former they are sandstones and shales, in the latter they are in great part soft limestones and clays. The nature of the rock determines the character of the soils and vegetation, the soils being due to the decomposition of the underlying rocks. This is not however the case where the solid rocks are covered by drift deposits; here the soils are formed by the decomposition of the drifts.

The sites of early settlements and villages are generally determined by geological surface-conditions, water, and a dry and fairly fertile soil, being required. The land divisions resulting from these early settlements are in like manner dependent on the physical features, which however are not usually the actual boundaries of the parishes, townships, etc. But where the hills are exceptionally high, the summit, or the local water parting, is often the boundary.

The "limits" of geology and physical geography are indefinite; the two sciences shading off into each other and interlacing over a wide borderland common to both.

Mr. E. G. Ravenstein said: After the very excellent and reasonable addresses which we have listened to from Mr. Clements Markham and Mr. Topley, there remains very little for me to say. I may at once acknowledge that I agree with them in all the main points. Some years ago when the same subject was under discussion with a view to the establishment of professorships of geography at our universities, certain geologists were far from showing the same moderation in advancing their claims. It was indeed claimed in that day that physical geography at all events constituted merely a subordinate department of geology, and that there existed consequently no necessity for establishing new professorships. I maintain that geology holds the same relation to physical geography as history does to political geography. Both the physical geographer and the geologist start from the present period, but whilst the geologist goes backwards, and reveals to us the physical history of

our Earth, the geographer concerns himself with existing conditions only. As Mr. Markham said very appositely, he endeavours to present to us a truthful and complete picture of the existing surface features of our Earth, whilst noting and studying at the same time all those changes which are going on under our eyes, or which are known to have been going on within historical times. As a geographer I am interested, for instance, rather in the mineralogical character of the rocks, their arrangement, than their age. The question of the age of certain Scotch rocks, which some years ago agitated the geological world, did not concern us as geographers. On the other hand, and looking to the second great department of our subject, namely, political geography, which studies the Earth as the abode of men, we are very much interested to know whether these rocks supply a fertile soil or are merely capable of giving sustenance to a poor and stunted vegetation; whether they are pervious, like chalk, or impervious clay; whether by their mass or disposition they hinder or promote intercourse between neighbouring regions. I quite agree with Mr. Topley that the knowledge gathered by the geologist will immensely help us in a thorough understanding of the existing physical features of the Earth, just as the researches of the historian throw light upon and illustrate the political geography of the various countries. I do not think that it will be possible or advisable to draw a hard-and-fast line which is to divide the domain of the geologist from that of the physical geographer. There is some common ground between us, and I feel sure we shall not quarrel over it. If the geologist affords us glimpses into the past, we shall gladly avail ourselves of his services, just as he, in his turn, would make use of those researches which are recognised as being strictly geographical.

Professor LAPWORTH, F.R.S., said: I came here, like most of you, not as a teacher, but as a learner. To stratigraphical geologists, like myself, physical geography and geology seem to merge insensibly the one into the other. While I admit the theoretical correctness of the line of separation drawn by Mr. Markham, it appears to me that physical geography enters into stratigraphical geology, and is actually part and parcel of it. Physical geography is the geography of the present, stratigraphical geology is the geography of the past; the one is impossible of full comprehension without a knowledge of the other. The geologist is indebted on all occasions to the physical geographer for assistance. If the stratigraphical geologist, in working through a formation, discovers a bed of pebbles, he turns to geography for a description of its mode of origin. If he finds red sandstones, he in some way or other obtains from geography a correct description of the manner in which such sands are forming at the present day. If, indeed, the stratigraphical geologist wishes to complete his information regarding the mode of origin of any stratum whatever, he turns to the

description of the formation of similar sheets in modern physical geography. The information he receives becomes part of himself and part of his subject; so that, in the course of time, he feels bound to consider the two sciences as more or less identical. Our science of stratigraphical geology is based on that of physical geography. Every phenomenon we discover in the rocks, we interpret, if possible, by known facts in physical geography. The never-failing bank of physical geography has given us, so to speak, the current coin of geographical facts which we employ in all our theoretical speculations. As Mr. Teall showed in his address to Section C, whenever we have attempted to interpret or to speculate by any other means, we have always come to grief, and have been forced back upon the hard and accepted facts of recent physical geography. So much for the indebtedness of the geologist to the geographer Now the geographer, on the other hand, very rarely indeed turns to his brother, the stratigraphical geologist, and asks for some return for all these benefits. But the geologist is willing to pay the bill whenever it is presented. When that is done, then it appears to me that physical geography will rise to a far greater height than it has yet risen, and no physical geography text-book will ever be published unless it contains, not only a description of countries and their climatic phenomena, but also an account of their geological history. Mr. Topley gave several illustrations of the relations between physical geography and geology, and as I was looking at his geological map of France, it struck me that I might give you an extra one. When the geographer gives you a description of France he tells you that it consists of two large open valley-plains, sloping westwards, one in the north, and one in the south; and that, in addition, there is a long and narrow valley in the east, running south to the Mediterranean. Next he tells us how these three valleys are divided from each other by broad rising grounds in the centre, and are towered over by vast mountain chains to the east and south. Then he goes on very properly to explain how the drainage, the climate, and the productions are all affected by this disposition of the ground. Every fact and theory of explanatory value which he can worm out of the chemist, the physicist, the meteorologist, the agriculturalist and the like, is utilised carefully in his text-book; but he rarely or never asks the geologist a single question. The physical geographer contents himself with describing the form of the surface of the country itself, and the relationship of that form to the rest. He never attempts to explain how that surface arose, what is its history, and what its relationships. Now the geologist, who is also a physical geographer, can go further, and explain the origin and meaning of these surface features. He knows that these three great valleys are old sea-floors lying in the laps of three great crust-folds, and that the relative widths of these valleys their slopes, their soils, their features, all depend upon the degree to

which their boundary ridges have been crushed up into mountain chains. Even the direction and structure of the mountains are dependent upon the history of the rocks of which the country is built: every detail of surface form becomes explained when once physical geography and geology are united. It would take me far too long to show you how in other cases this geological map illustrates similar points on physical geography; but it is my conviction that the day is coming when the geographer will turn to the geologist for information as naturally as does the biologist. When less than a hundred years ago the geologist began the study of fossils, and found that they were the relics of organised creatures, and were bound up with the living beings of the present day, then biology was born as a truly great science. At the present time, largely because of its union with paleontology, biology is advancing with the most marvellous rapidity; for in addition to studying living creatures as they now exist, the biologist is able to study the historical development of such creatures through the long ages of the past. I believe that it will be precisely the same when geology and geography are welded more closely together. The physical geographer will study the past geography of the world as carefully as he studies the present, and the science will then undergo a complete renaissance. I look forward to the time when the physical geographer, who knows nothing of stratigraphical geology, will be consigned by the geologist to his museum of extinct monsters, and the geologist who has no knowledge of and gratitude to physical geography, will be looked upon by the geographer as a candidate for a lunatic asylum.

Dr. VALENTINE BALL, C.B., F.R.S., said: Being connected as I am officially with the administration of a school of art, I feel that the case of geography and geology may be compared to that of art and anatomy. In the case of art-students we require a study of anatomy, and I think that the education of geographical students should require a thorough study of the principles of geology, which has been well described as the anatomy of the Earth. With regard to the remark made by Mr. Ravenstein as to the debt the geologist owes to the geographer, I may say from my past experience as a field geologist in India, that while feeling the greatest gratitude to those geographers or map constructors who had compiled faithful representations of the physical features of the country which I explored as a geologist, I cannot speak in too strong words of condemnation of those who produced bad maps in which imaginary physical features were inserted.

Dr. R. D. ROBERTS (of the London University Extension Society), said: There seem to me very great advantages in stating the question under discussion in the form adopted by Mr. Topley rather than in that of Mr. Markham. It is better to treat the matter as a discussion of the

relations between physical geography and geology, than as a definition of limits. Defining limits and frontiers always to my mind suggests the approach of antagonistic bodies, and anything which tends to suggest the idea that there is some sort of hostility or antagonism between physical geography and geology is most undesirable. The relationship is merely one of time, of the present and the past. The object of the stratigraphical geologist is to unfold the condition of the Earth at different stages of the past, in other words, to reconstruct the old physical geography. The Earth as it is to-day is the result of evolution; we want as vivid and complete a picture as possible of every stage in that evolution from the beginning up to the present time. And although we cannot hope that geology will ever become so absolutely completed, yet from year to year we shall approximate to a complete history of the Earth—the succession of its old physical geographies. No kind of distinction can be admitted between physical geography and geology except one of time. I cannot see how, if physical geography is merely an account of the present phase of the history of the Earth, it can possibly rank as a special science? We have not yet the materials for the restoration of the old physical geographies as we have for the study of the actual physical conditions. A time may come when just as we have now scientific men who are specialists in the existing physical geography, we may have specialists in the physical geography of each geological period.

Dr. H. R. Mill said: It is surely unnecessary to contend that the definition of limits suggests opposition. The question is one merely of deciding what is the most natural cleavage by which the portions of knowledge pursued by different specialists may be marked off. However advantageous the chronological dividing line may be philosophically, it is scarcely of practical utility, as the studies of specialists could not possibly be circumscribed by so arbitrary a division. In common with previous speakers I feel that geology and physical geography to a large extent interpenetrate each other, and that the two sciences cannot be easily divided by any restriction of the field of one or of the other. But a very obvious distinction may be drawn in another way. The phenomena considered by physical geography and geology are in great part the same, but they are considered from a different aspect. In physical geography we require to borrow many conclusions from geology, but we do not on that account work by purely geological methods. Some parts of geology constitutes part of the food of physical geology, but they are combined with other elements, assimilated and built up into the body of geography. Thus geography preserves a distinct individuality and is capable of definition. Physical geography strictly speaking has to do with the discovery and description of surface forms, and for all information regarding the composition or classes of rocks it accepts

the conclusions of geology, placing these in such a light as to explain surface features and predict the probable immediate surface changes.

Mr. H. YULE OLDHAM, Lecturer on Geography at Cambridge, said: We must not let it be imagined that physical geography is the whole of geography, although it lies at the base of the science. The relation between geography as a whole and geology should not be overlooked. Mr. Markham brought out well the importance of the historical aspect of this question. I do not think the suggestion that a time is coming when geology and physical geography will be completely fused, is likely to be realised. In all branches of science the rapid increase of knowledge has caused a tendency towards sub-division rather than assimilation. It is becoming more and more important that the two sciences should be separately treated, and we in this country have much to learn from our friends on the continent who have fully recognised the importance of geography as the subject of special University professorships and examinations.

Professor BONNEY, F.R.S., said: It seems to me, that according to the wording, this discussion is a search after the unattainable, which as a general thing is not satisfactory. Everything I might have had to say has been already said by previous speakers. Speaking of the limits between geography and geology seems to me something like speaking of the limits between a river and the sea. The sea is one thing and the river another, but who shall say exactly where their limit is. The whole question either lies in a nutshell or admits of endless discussion. The broad distinction is laid down by the names themselves —geography and geology. The one partakes more of the nature of an art, and the other more of the nature of a science. Geography deals with the description of phenomena, geology rather with the interpretation of phenomena. But it is quite obvious that you cannot get good descriptions without having some knowledge of what you are seeking for, that is to say without collecting facts in a scientific spirit, and this, it seems to me, has been admitted again and again by many of the previous speakers. And so I think that while the ground is to a certain extent distinct, there is a common field on which you must meet and join hands, and when you can be of the highest service one to another. It seems to me that Mr. Markham emphasised the matter well, when he said geography was rather concerned with the present, and geology with the past. The geologist takes facts from the present, using them towards the interpretation of the past, while the geographer has the advantage of that interpretation, and of that which is before his eyes. There are, however, some parts of their subjects which are pretty well distinguished. For example, the geographer concerns himself not at all, or in the smallest degree, with paleontology. The geographer is concerned rather with the general results of mineralogy than with the details of it. Again the

geologist is not concerned with the making of maps; that is the business of the geographer, but the geologist is infinitely indebted to the geographer who will supply him with good maps. So then it seems to me the needs and aims are to a certain extent different, and the motives of the two are also different, but that there is between them a large common ground where they may work together harmoniously and mutually assist one another.

Mr. J. Y. Buchanan, F.R.S., said: Geography and geology have always appeared to me to be very nearly allied; but their separate existence is recognised by geology occupying a section of its own. There are other subjects allied to geography, and I mean physical geography, which occupy a less satisfactory position.

We have long had the physical geography of the land; we have now in oceanography the physical geography of the sea; and in meteorology and climatology we have the physical geography of the atmosphere. Oceanography has already been recognised by the sitting of a joint section of Sections B and E at the last Edinburgh meeting. The position of meteorology is anomalous, because it is included among the subjects of Section A. This section, however, is so crowded with physical work from the laboratories that open-air work has difficulty in securing a hearing. It seems to me that, along with climatology, it ought to come into the section of geography.

Colonel Godwin-Austen, F.R.S., said: I cannot see myself how it is possible to define the limits between physical geography and geology, for as Mr. Topley so well expressed it, the two dovetail, so far the one into the other. Mr. Oldham has said very justly that at the present day there is a tendency for all sciences to be broken up into different sections, a sort of specialisation, but I think it would be to the detriment of all the sciences if they were to be bounded by any hard-and-fast lines. Mr. Markham laid great stress in his paper on the limits to be defined by historical time, but if we did that I do not see how it is possible to draw that hard-and-fast line, on account of the different range of history in different continents, for instance, in India, Australia, and Egypt. It is most difficult to draw any line. I think it is also shown in books of travel, and I would allude, for instance, to that excellent one, 'Travels in the Himalaya,' by Sir William Hooker, that the more scientific the traveller, the more interesting is the result of his labours in the field.

Sir Archibald Geikie, in summing up the discussion, said: Having, as I may say, one foot in geology and another in geography, I have sympathy with the desire expressed by the geographer to find some satisfactory limit between his branch of inquiry and geology. At the same time I feel strongly with the geologist that any line of division drawn between the two subjects must be an artificial one, the adoption

of which must be determined almost entirely as a matter of convenience. If it be convenient to geographers to draw the line proposed by Mr. Markham, by all means let them do so, but they can hardly expect that geologists will be content to recognise that line as defining their own territory. Since geology may be regarded as the history of this Earth, whatever is necessary for the elucidation of that history will be claimed by the geologists as part of their domain. Only as they understand what is going on at the present day can they ascertain what took place in past time. If you take away from the geologist the study of all that is taking place now, and maintain that this study is not geology but physical geography, he will answer, "I do not care what you call it, I must be at liberty to investigate the processes that are operating now in order that I may be able to explain what has happened in past time." But there is another point of view which shows how inextricably interwoven are the tasks of the geographer and the geologist. Not only is the present the key to the past, but it is equally true that the past is the key to the present. I do not think that this aspect of the question is sufficiently recognised with regard to the present surface features of the globe. The subject has been referred to by several speakers, but much detailed work is needed to show how the present surface of a country has been shaped. The history of a land-surface is often a long and complicated one, only decipherable with all the helps that modern geology can supply. I think it hardly possible to draw a line of division that shall be entirely satisfactory to both classes of investigators. Such a hard-and-fast line between the respective sciences does not appear to me to be either necessary or desirable. Good progress has already been made without it, and, even if it remains still undrawn, I cannot doubt that in the future, as in the past, geographers and geologists will co-operate cordially in promoting the advance of truth and knowledge.

EAST AFRICA—MR. ASTOR CHANLER'S EXPEDITION—LIEUT. VON HÖHNEL.

THE following communication, dated Daicho,* September 20th, 1893, has been received at the Society from Mr. W. Astor Chanler. The unfortunate accident to Lieut. von Höhnel is to be deplored. Though it has compelled him to return to Europe, Mr. Astor Chanler has determined, it will be seen, to carry out his expedition :—

This letter is taken to the coast by the men who are carrying my

* No doubt the "Dhaicho" of Lieut. von Höhnel's, in Vol. I. *Geographical Journal*, p. 576. It lies north-east of Mount Kenia, a few miles north of the Equator, and about 38° 14′ E. longitude.

companion, Lieut. von Höhnel, who was severely injured by a rhinoceros on August 26th. His wound is a serious one, and necessitates his immediate return to Europe. My grief at this accident will be easily understood, and I feel sure it will be shared by all who have the interest of geography at heart. Without Lieut. von Höhnel's assistance and skill, what information I can give you will, I fear, be worth little. However, I shall continue my journey, and hope, with a little good fortune, to be able to throw some light, at least upon the manners and customs of the peoples living to the north of this place.

I will now give you an account of our work since my last letter written in June. We left Daicho with sixty-eight men on June 5th. We returned to this place on September 18th. Lieut. von Höhnel up to the time of his accident made a thorough map of all the country traversed. He has promised to send you a copy of this map as soon as he has completed it. Our object in leaving Daicho was twofold—viz., to discover and trade for beasts of burden with the Rendile, and to find a road to the north suited for the whole expedition. I had procured a guide here who promised to lead us to the Wandorobo, and who knew the whereabouts of the Rendile. We started with thirty-nine donkeys carrying seventy-two days' food; but these soon died of the same plague which had destroyed our beasts here in April and May. Up to the date of this letter I have lost one hundred and fifty donkeys, besides fifteen camels, since leaving the coast. After some hard marches we reached Mount Lolokwui. This mountain is called Walke on Lieut. von Höhnel's former map. It is at least 6000 feet above sea-level, and is of peculiar construction. It is a narrow plateau, highest at its southern end where its front is sheer rock till its base. It slopes gradually to the north, and is, say, 5 miles long by 2½ miles broad. Some 6 miles north-west of Lolokwui towers Gerguess, called Ngaroni on all Lieut. von Höhnel's former maps. Gerguess is 10,000 feet above sea-level. Both these mountains are inhabited by Wandorobo, who subsist almost entirely on honey and do not wander. From Gerguess to Mount Nyiro, the General Mathew's range stretches in a continuous chain containing the high mountains Lengiyu, Maloni, and Lasuran. This range has very little water, and is said to be inhabited by only a few honey-eating Wandorobo.

We were forced to wait ten days at Lolokwui for a guide. At the end of that time we procured a Burkeneji, or native of Samburu land, who had left his people and joined the Wandorobo. He told us that we should find the Rendile in the neighbourhood of a spring called Seran. He promised us long waterless marches, and the next few days proved his promise correct. The first water from Lolokwui is Lokolie, a dry river-bed where very bad water may be got by digging. This is nearly 25 miles due east from Lolokwui. Two marches from Lokolie, say, 18 miles, in a south-south-east (more pro-

bably north-north-east) direction, is Seran, a large spring. Our guide was disappointed in not finding Wandorobo at Seran, and said he could not lead us to the Rendile as he was personally ignorant of their whereabouts, and had trusted to getting the required information from his brethren at Seran. There was nothing to be done but look for ourselves, so I took ten men and plunged into the desert. My men all carried water. I marched all night—the moon was full—and at noon next day saw camels feeding some 2 miles away near dum palms. These trees meant water, and we soon reached a dry river-bed which furnished us with good water after digging 3 feet. I at once left my men, and taking the guide and an interpreter pushed rapidly on to where I had seen the camels. I came upon some hundred natives in a shady spot; they at once set up a war-cry and put their arrows to their bows. These were Rendile, and their excitement caused by their taking us for Borana. I soon lulled their suspicions, and they became very friendly. I lived for three days in their neighbourhood with five men, having sent the rest back to Seran for my caravan. When that arrived I endeavoured to trade for camels and donkeys. I was able, after three days' hard work, to purchase ten good donkeys at exorbitant prices, and then trade stopped. I reached the Rendile on June 30th, and we left on July 7th. During that time I gathered what information I could, which I now give you, together with the impressions they made on me.

The Rendile are physically a fine race; tall and well made, reddish in colour. In appearance they greatly resemble the finest type of Somal. What deviations from this type are exhibited are, in my opinion, caused by intermarriage with the Burkeneji or Samburu people. They have, however, no traditions which connect them in any way with the Somal race. I venture to think that they may be a Somal tribe separated centuries ago from their brethren. In support of this theory is the tale, current among the Somal, of a lost tribe. Their language is nearly similar to the Somal; many words are exactly the same. My Somali could make themselves understood and could understand much of the Rendile talk. In addition to this, their utensils and camel harness are exactly the same; their life with their herds and flocks identical; their weapons, though of much inferior workmanship, are of the same class, and their character is strikingly similar. My Somali said they were certainly of Somali extraction. My Galla interpreter (a pure Galla) said they used no Galla words. I, however, heard them use the Galla word of welcome, "nag'a." The Rendile men wear either American sheeting or well-tanned goat-skins. The women wear untanned skins, and about their waist a curious covering made of many rope ends, 14 or 15 inches long, fastened to a belt. Their hair is worn something in the fashion of the crest of an ancient helmet, and stiffened with grease. The tribe is marked by two customs which are neither of them practised by the Somal. Both sexes cut out the two lower front

teeth (as do both Masai and Burkeneji), and they cut the navels of all males at the age of five years. This operation leaves a small round hole whose edges are flush with the belly. The Rendile consider this the distinguishing mark of their tribe, but admit that the Marle, living at the north end of Lake Stephanie, have the same practice. (These people may be settled Rendile like those in Reshiatt.) I noticed a peculiarity of their eyes which may be worth noting. Nearly all the Rendile I saw had distinct blue or light grey rings around the pupils of their eyes. I have noticed this also in a few Burkeneji. They circumcise, in the manner of the Masai, and cut the clitoris of all females before marriage. My impression of their character is that they are far more intelligent than the Masai, but are, like that race, truculent, fierce and difficult to deal with. This behaviour may have been caused by the small size of my caravan. I give you the following information as it fell from the lips of a Rendile. It must be taken with great caution. These people believe that God first made two Rendile and then two camels; from these sprang the race and their camels. Their native place is Nado or Gwehe, situated near Lysammis,* which lies south-west from Marsabit.

All males are circumcised on reaching the age of puberty, and have their two lower front teeth cut out when they get their second set. The females lose their two lower front teeth and are subjected to excision at the time of their marriage. Polygamy is practised on a small scale—a rich man may have three wives. The marriage is by purchase; a wife costing seven female goats and thirteen camels. The funeral ceremony is as follows: The corpse is buried in a sitting position, after being shaved. The grave is deep and piled high with stones. A spear is fixed in the grave. The near relations shave their heads and then kill a camel on the grave, which they eat there in company with their friends. All inhabitants of the village of the deceased go in mourning for one month. This is done by removing all ornaments or covering them with skins. The property descends to next of kin. Primogeniture is recognised. When the month of mourning is passed the heir gives to each of his relations one camel. Adultery is unpunished; but immoral girls are driven from their village and their offspring slain. A murderer becomes an outcast and his property is confiscated. Theft is punished by a fine of three times the value of stolen property. The chief food is the flesh of camels, goats and sheep and milk. They also eat the fruit of the dum palm and the flesh of giraffe and antelope, which they hunt from horseback. No other game is eaten.

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* Lesamis of the Royal Geographical Society's map of Equatorial Africa, 1883.

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fellow. He holds his office for life. The election is as follows. A mass meeting of the village is held and the object of their choice presented with a sheep. If he accepts it, it is a sign that he accepts office. They have two medicine men, who are consulted before the taking of any important step.

The number of strings of beads or pieces of wire worn about the neck or as rings on the fingers show the number of men the wearer has slain in battle. They mutilate their victims (a Galla custom); the chief of their village rewards them with a goat for each trophy, and sprinkles them with milk. They have Masai and Burkeneji as slaves. All Burkeneji, who were not ruined by the cattle plague a few years ago, have joined the Rendile and live with them as their brothers. There is also a village of Marle among them. They say the few Burkeneji who did not join them have sold even their wives for food, and now wander from place to place stealing and killing game, and are called Dthombon. The Rendile say they have twenty villages, that they are all encamped in this neighbourhood, and that they call this place Kome. I had no means of ascertaining their numbers. But I think they must exceed fifteen thousand. I saw some four thousand camels being driven home from pasture. These were said to belong to one village. If this is true, and can be taken as the average wealth of the village, then the tribe must possess more than fifty thousand camels. A rich man owns from four hundred to five hundred camels. The tribe certainly possess several hundreds of thousands of sheep and goats, many thousand donkeys, some hundred cattle and a few horses bought from the Borana. I never saw a Rendile village, but was told that when all were camped in a line they would extend for four hours—roughly 8 miles.

The Rendile have no idea whatever about trade. They wish for heavy American sheeting, but want it for nothing. Until we reached them, they had never even heard of Europeans. Some years ago a Swahili expedition, two hundred and fifty strong, fled after a few hours' intercourse with them. Not long ago some Barawa traders sold them the cloth which they now have. I advise no expedition to visit the Rendile unless carefully led and prepared to fight if occasion arises.

They did not tell me much about their past; but I managed to elicit the following information concerning their wanderings of late years. Some twenty years ago, they inhabited the plain south of Lorian Swamp, called Kirimar. The repeated raids made by Somali drove them across the Guaso Nyiro River. They then wandered from place to place, reaching Reshiatt, Marle, and Borana. Some five years ago they were encamped at Marsabit; but the Elgume made a successful inroad and they then left. Now they say they will stay where they are. Recently they defeated a large force of Ogaden Somal (Rer Abdula tribe) and slew their chief Abd Ibrahim. They

are at peace with no tribes but the Marle north of Stephanie Lake and the Embe on the Jambeni range. They inquired anxiously as to the whereabouts of the Leikipia Masai, and seemed relieved when told they had vanished from Leikipia. I think that it is not improbable that in the near future the Rendile, harassed by Somali raids, may occupy the magnificent pasture-land left vacant by the Masai.

We left Kome on July 7th and reached Seran on the same day. Lieut. von Höhnel went to Lengayer, some 18 miles north of Seran, to see whether or not a road led from there to Marsabit. His guide said there was a road *via* Saraba and Lysammis; but as I learned there was no road from Marsabit to the north in this season we did not follow this route. I returned to Daicho in pursuit of runaways, and Lieut. von Höhnel pushed on to find Wandorobo to act as guides. I met him at Lolokwui. During my absence he had reached the base of the Leikipia plateau and had found Wandorobo. He had also discovered a river, hitherto unknown, called the Sayer. This river is some 40 miles long and is nowhere navigable. It rises in a swamp called Kissima situated on the Leikipia plateau near the Loroghi range and some 25 miles from the southern extremity of that range. It flows for about 20 miles almost due south, and then bends its course to the east, eventually drying up between the mountains Lengiyu and Lasuran of the General Mathew's chain. We discovered that there is a road to Nyiro from Sayer, and it was while waiting for a guide to lead us thither that Lieut. von Höhnel was attacked and wounded by a rhinoceros. I at once returned to Daicho which we reached on the 18th inst.

In returning from Sayer I followed the Guaso Nyiro and discovered that it receives two streams: one called the Ngare Ndare, flowing from Kenia and following the eastern base of the Donyo Lol Deiko range till it reaches the Guaso Nyiro. The other is called Isiolo, and flows from between Janyai and Msa'ara on the Jambeni. Neither of them are considerable streams. Now the Guaso Nyiro's course and end are known, for there can be no doubt that the river ends in Lorian Swamp; though a small stream is said to flow out of the swamp to the eastward during the rains. The country lying to the north of the Guaso Nyiro is nearly a desert. It is entirely of gneiss formation. Game is plentiful about the water-holes, and here are many Wandorobo who live on game. These people are now numerous as they have been joined by many Masai Burkeneji since the death of their cattle. I got the following information concerning the dispersion of the Masai from a woman of that race. When their cattle first began to perish, the Masai who had lost theirs attacked those of their brethren who were more fortunate. Thus countless internecine wars sprang up which destroyed nearly all the fighting men in Leikipia. When they were in this weakened state, the Masai called

Leburego, who live to the north of Lake Naivasha at a place called Kinangop,* fell upon the Leikipia people and utterly destroyed them, killing two Laibons. One Laibon fled to the Jambeni range. Three others with their followers settled in Kithere near Kitu at the base of Mount Kenia. These are the remnants of the Leikipia Masai, once so numerous and powerful.

At present my affairs are in anything but a prosperous condition. The men I sent to the coast for donkeys, goods and porters have now been gone nearly four months. So I fear they may not come at all. I must send Lieut. von Höhnel to the coast at once. When these men return I shall endeavour to push on to the north. If I can get enough donkeys I shall try and reach the Borana, and unless the difficulties appear insuperable I shall from there try to reach Berbera or Zeila. I have one hundred and twenty-five men and with seventy-five donkeys I think I have a fair chance of success.

I will write further particulars if opportunity occurs.

THE GREAT BARRIER REEF OF AUSTRALIA.

By HENRY O. FORBES.

THE great Barrier Reef of Australia was, as is well known, discovered on June 11th, 1770, by Captain Cook when, in navigating H.M.S. *Endeavour* along the east coast of Australia, his ship "struck and stuck fast."

"Immediately we hoisted out the boats," he records in his Journal, "and sounded round the Ship and found that we had got upon the south-east Edge of a reef of Coral Rocks."

It will be remembered that the vessel, rescued from her perilous position by the consummate skill of her commander, was safely guided into the Endeavour River and there repaired. Here Cook ascended a hill to obtain a view out to sea.

"At this time it was low water," he continues, "and I saw what gave me no small uneasiness, which were a Number of Sand-Banks and Shoals lying all along the Coast; the innermost lay about 3 or 4 miles from the Shore and the outermost extended off to Sea as far as I could see."

The coral-rocks and shoals thus for the first time viewed with unhappiness were the off-shore fields of whose wall-like boundary he had as yet no knowledge or idea. On the repair of his ship he again pushed northward in his eager desire to reach the East Indies by the strait he

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* Kinang-gop is the plateau to the east of Naivasha.—Ed.

instinctively believed must separate New Wales (as he then called Australia) from New Guinea, but found himself still hampered and surrounded by reefs. At no great distance to the north-east, however, he discovered and brought up at Lizard Island. Here he again landed, and in the anxious hope of resolving the entanglement of shoals with which he was beset, he ascended, he tells us,

"the highest hill on the Island, where to my mortification I discovered a Reef of Rocks lying about 2–3 leagues without the Island extending in a line north-west and south-east farther than I could see, on which the sea broke very high. This, however, gave one great hopes that they were the outermost Shoals, as I did not doubt but what I should be able to get without them, for there appeared to be several breaks or Partitions in the Reef and Deep water between it and the islands."

Cook's great hopes were fully justified two days later when he safely escaped into the open sea. He had thus discovered the rampart-like edge of the Barrier and the first of those narrow gate-ways of so much importance to vessels passing from the eastward, which never fail to strike with wonder the voyager passing through them from the boisterous sea outside into the placid water within.

"The moment we were out," the Journal proceeds, "we had no ground with 100 fathoms of Line, and found a large Sea rowling in from the south-east. . . . A Reef such as one speaks of here is scarcely known in Europe. It is a wall of Coral Rock rising almost perpendicular out of the unfathomable Ocean always over-flown at high Water and generally 7 or 8 feet deep in places at Low water."

Thus the main characters of this wonderful wall—more than 360 leagues in length, built up as he believed from the bottom and broken by passages along its outer margin—described by Cook more than one hundred and twenty years ago, were added to only in detail by subsequent surveyors. Flinders' survey in the *Investigator* but extended Cook's accurate work, which was yet further added to by King's and Blyth's observations. Still, till the date of Darwin's theory of the origin and formation of coral-reefs, no more exact explanation of the structure of the Australian Barrier was attempted than Cook had given. While Captain Blackwood, during the surveying voyage of H.M.S. *Fly* in 1842–6, fixed, with the better appliances of his time, the position and outline of its reefs and shoals with greater exactitude, the distinguished naturalist of his expedition, Mr. Beete Jukes, investigated the structure and general features of the reef and its builders, the result of his observations confirming, he believed, Mr. Darwin's views. After these explorers Captains Owen Stanley, Yule, Denham and Moore of the Royal Navy, with the officers of the *Paluma* on behalf of the Queensland Government, share together the credit of bringing our acquaintance of this vast structure to its present intimate state. With our growing knowledge of this and other reefs in different parts of the world, doubts have at length arisen among those who have personal acquaintance with these structures as

to whether the beautiful, fascinating and long-accepted conception of Darwin is as widely applicable as it has been supposed to be, and at the present moment it is a hotly-disputed question. It ought to be remembered, however, that the universality of the subsidence theory as the explanation of the formation of coral-reefs, which is attributed to Darwin by some of his supporters, is wider than Mr. Darwin himself held or advocated.

Mr. Savile Kent has lately published a magnificent folio * exclusively devoted to the description from every aspect of the Great Barrier of Queensland, which the author calls "one of the wonders of the universe." Without invidiously comparing the natural phenomena of neighbouring systems, we may at least admit that among the wonders of the one with which we are somewhat more acquainted, the Great Barrier is not the least. The book is adorned with a large number of photo-mezzotype illustrations of reef scenery, and with chromolithographs—unfortunately not the most successful—of the coral-polyps, of the anemones, fishes and other dwellers on the reef. No illustrations have ever before been produced either more excellent as pictures, or so vividly presenting to the imagination the general aspects of a coral-reef and the appearance of its builders and inhabitants, as do Mr. Kent's forty plates. His first chapter gives a general description of these plates which might have been more appropriately worked into the text of that dealing with "the structure and most probable origin of the Great Barrier Reef," which is the portion of the book most interesting from a geographical aspect, and that to some points of which we shall confine our remarks.

After exploring the reef Mr. Kent considers he has evidence to show that reefs are not invariably formed in localities where the conditions favour the growth of even reef-corals.

> "The limit of distribution of typical reef-forming corals, and their abundant disintegrated residue extends . . . considerably to the south of Lady Elliot Island [the southernmost coral reef], but without giving rise to a trace of reef-formation."

In Moreton Bay (about 27° S. lat.) "masses of the dead coralla of *Madrepora* are found *in situ*, covered by 2 or 3 feet of water at lowest tide, associated with living corals of other forms, forming coralla" over a hundred pounds in weight. These are "the most southern out-post representatives of the Great Barrier Reef," but they are reefless corals. Mr. Kent figures in one of his plates specimens of dense rock-conglomerate which he collected on the beach of Sweers Island in the Gulf of Carpentaria, the ingredients of which,

> "correspond in every essential detail with those of Humpybong Beach in Moreton Bay; but in this latter instance they possess no elements of cohesion, and

* 'The Great Barrier Reef of Australia: its Products and Potentialities,' by W. Savile-Kent. W. H. Allen & Co., London [1893].

consequently cannot form a reef. The foregoing evidence is practically conclusive in support of the view put forward [on a previous page] . . . that coral-reefs are produced in the tropics, not with relation so much to the intrinsic reef-constructing properties of the specific coral polyps, but with relation to the rule that reef consolidation (or the amalgamation of coral *débris* [of the more fragile and relatively quick-growing species of *madrepora*] into a more or less solid coarse or fine concrete, or into a finer-grained compact limestone [of which the greater mass of all coral reefs is composed]) is associated only with the rapid evaporation of lime-saturated sea-water on intertropical, tidally exposed coral banks or beaches."

Mr. Kent, therefore, is of opinion that the temperature found only in intertropical regions, plus the alternate complete submersion during the rise of the tide, and the exposure to the atmosphere during its ebb, are the essential factors in reef growth. This cementing process during evaporation, he thinks, has not received sufficient prominence. He believes that the *Lophohelias* and *Dendrophyllias*, found at great depths in different parts of temperate seas, "would act with equal efficiency as reef-builders, if they were capable of translation to this higher tidally-affected plane." From this latter consideration especially, Mr. Kent has come to the conclusion that the Australian barrier must of necessity support the Darwinian hypothesis of the origin of barrier reefs by subsidence, and during a prolonged period of subsidence only. In the Albany Pass Mr. Kent admits that there is evidence of elevation;

"but accepting this as proven . . . the amount raised, a foot or two only, would be as nothing compared with the latitude of movement in one direction, or the other that is required to account for the Barrier's mass."

Among other proofs of subsidence he instances the similarity of the fauna and flora of New Guinea to that of Northern Queensland, as indicating a former land connection—now vanished—between the two countries; and the fact of the principal gate-ways through the reef being opposite the mouths of the larger rivers. These gaps have been long held to indicate subsidence, because the corals have been prevented, it is believed, from growing in them by the discharge of fresh water into the sea, when what is now the barrier was a fringing reef, and consequently near the land.

Mr. Kent evidently believes—as Cook did—in the "barrier's mass"—"a stupendous coral-constructed fortification" rising from the abyss of the ocean. Now an attentive examination of the Admiralty chart shows that, if there is no coral rampart, as Mr. Kent asserts, south of Lady Elliot Island, there does extend a conspicuous bank (narrowing as it trends south to terminate off the coasts of Tasmania) whose steep, seaward edge, as indicated on the chart, is continuous with that of the Barrier Reef, and drops, just as *it* does opposite where it is faced with coral further north, suddenly into water of a depth of between 1000 and 2000 fathoms. For instance, the depth of water over this bank to the south of Lady Elliot Island increases gradually from the shore to

its sea-margin, at the approximate latitude of 28° S., from 10 to 49 fathoms; at 26° 20′ S. (nearly opposite Laguna Bay), from 20 to 58 fathoms; at 26° S. (in the vicinity of the south entrance of Great Sandy Strait), from 27 to 44 fathoms; opposite Curtis Channel it grades from 13 to 30 fathoms. Comparing these with the depths recorded over the reef to the *north* of Lady Elliot Island, we find at 23° S. (opposite Capricorn Channel), a gradual slope from 9 fathoms to 100 fathoms at the sea-edge of the Barrier; at 23° 30′ S. (off Port Clinton), the soundings on a line running nearly east begin at 29 and descend gradually to 53 fathoms, where it strikes Swain's Reef (or atoll); and beyond it to 84 fathoms where the drop into deep water is made; off Hillsborough Cape, the gradient is from 5 to 31 fathoms; in Halifax Bay (about 18° 15′ S.), from 10 to 30 fathoms. Off Cape Cleveland the following line of soundings is given entire because showing an irregularity: 18, 19, 23, 24, 27, 32, 19, 24, 25, (edge of barrier) 31, 39, 480 fathoms. Off Cape Flattery, where the reef is very narrow, an even depth of about 19 fathoms occurs. It will be seen, therefore, that the general depths over the coral-area from Lady Elliot Island north to Cape Flattery, exhibit no very marked divergence from those over the non-coral bank south of the latitude of reef-building corals, except that in the southern region there is a slightly greater depth along the shore, with a general increase as the bank trends to the south of 28° S. lat. North of Cape Flattery, however, there is an elevation at different places seaward to the under-water margin of the Barrier, as in front of the Second Three-mile Opening, where the in-shore depth is 17, and over the edge of the Barrier 12 fathoms. Opposite Cape York, the soundings, however, descend slowly seaward from 10 to 20 fathoms. The soundings outside the bank and the barrier-reef indicate that both rise from a plateau of much the same level. At the last meeting of the British Association a committee was appointed to consider a project for investigating the structure of a coral-reef by boring and sounding. It will be interesting to discover, should borings be made on the Barrier, whether there is more than a comparatively thin crust of coral-rock, encasing a bank similar to that extending south of Lady Elliot Island, instead of as has been so generally supposed, "a stupendous coral-constructed fortification" rising from the depths of the ocean. What grounds are there for the opinion that the Barrier has been built up from depths greater than 200–300 feet? Are there any ascertained data for believing that just at that latitude where the water of the sea attains the temperature suitable for the healthy growth of reef-building corals, the character of the southern bank changes; that it terminates there more or less abruptly; and that a rampart north of that point has been raised up by coral agency to about the same level as the southern bank?

A transverse section of the reef is reproduced (with acknowledgments to Jukes) by Mr. Kent as headpiece to one of his chapters, which conveys,

according to our interpretation of the Admiralty chart, an erroneous idea of the general aspect of the reef-flat. The line of section given shows near the coast-line a comparatively deep passage, generally designated the lagoon-channel, rising into islands with water-ways between them, and these separated by a channel—like the other two shallower than the lagoon-channel—from the higher outer edge of the steep barrier-wall descending into the deep sea. This view of a deeper lagoon-channel which separates the Barrier from the shore has been generally accepted as an accurate description of the facts. If, however, the soundings in the Admiralty chart—from which are taken those given above—be carefully examined, it will be observed, if we have read them aright, that there is a gradual slope from the land—well marked at all events from far to the south of Lady Elliot Island to as far north as Cape Flattery (S. lat. 15°)—all the way to the Barrier edge; and that within the coral area the pseudo-atolls (such as Swain's Reef), the various cays, and the more or less extensive reefs and shoals, rise from the inclined floor of this slope to the various heights they attain. North of Cape Flattery, however, as noted above, we enter a very complicated region in which the gradient in many places *ascends* seaward and the deeper water is nearer to the shore than to the reef. In this region we have indications of elevation, as Mr. Kent points out.

In regard to Mr. Kent's views that the formation of reef-rock occurs exclusively within the tide marks of the tropics, there will be found in the *Quarterly Journal* of the Geological Society for 1891, a very important paper by Mr. Jukes Brown and Professor Harrison on the Geology of Barbadoes, which seems to have escaped the author's notice. There it is shown that the elevated reefs of that island (as well as those of Cuba), which rest on a radiolarian and, therefore, a true oceanic deposit, and are not less consolidated than coral reefs elsewhere, have been formed "during successive periods of rest, or of very slow upheaval following shorter periods of more rapid upheaval." They present not the slightest evidence of subsidence.

Again with reference to the large openings by which vessels find entrance and exit across the Barrier-edge, can the explanation that they are due to the fresh-water discharge from rivers—now too remote to influence the Barrier-edge—when the Barrier was a fringing reef, be accepted as conclusive, when there can be detected across the reef-flat no corresponding break or channel stretching from the gap towards the present river-mouth, to whose discharge Mr. Kent assigns the gap, as effect and cause? The river still exists, but its fresh-water discharge has produced no appreciable effect on the shoreward reefs. If we follow a line from the mouth of the Burdekin River to Flinders' Passage we find that the soundings graduate thus:—6, 10, 16, 10 (no bottom), 25, 38 (in the passage): 45, 250 (no bottom) fathoms. The depth in the Barrier opening of 38 fathoms, it will be noted, is still not yet beyond

that suitable for the growth of reef-making corals, especially in a situation so favourable for food and oxygenation of the water. The gap must have been covered, if subsidence has been in progress, for a long period after the river-discharge ceased to affect it, by that depth of water which is held to be favourable to the most luxuriant growth of coral polyps. It is remarkable also that opposite both the Second Three-mile Opening and Cook's Passage there are no rivers to whose discharge these gaps can be assigned; besides, north of the former, there are numerous openings, with no rivers entering the sea near them.

The greater part of the remainder of Mr. Kent's volume deals with the "products and potentialities" of the Barrier Reef. He gives an account of the pearl and pearl-shell fisheries, whose headquarters are at Thursday Island near to the harvest fields in Torres Straits. The fishery yielded £50,000 in 1888, the best quality of shell bringing £177 per ton. Several new species of bêche-de-mer are described, while the sorts best known to commerce have been scientifically identified and some of them figured. The most prized sort, locally known as Teat-fish (*Holothuria mammifera*), is valued at from £140 to £150 per ton. The annual value of this fishery is about £23,000. The oyster-fishery has never yet exceeded £8000 a year in value. A long chapter is devoted to the different "food and fancy fishes," and many suggestions are offered as to the further development of these potentialities of this "stupendous" reef, of which the Queenslanders are naturally proud of possessing the monopoly. The publishers have spared nothing in paper, printing and sumptuous binding to make this volume worthy of the unsurpassed beauty of the reef-illustrations it contains.

THE MONTHLY RECORD.

THE SOCIETY.

A Gold Medal to the President.—Through the Peruvian Minister in London, the Government of Peru has presented a gold medal to the President of the Society, Mr. Clements R. Markham, C.B., accompanied by the following letter from the Foreign Minister of the Republic:—

"By the legislative Resolution of October 25th, 1892, promulgated on November 10th of the same year, the Honourable Congress of Peru determined to grant to you a medal of gold, as a recognition of the value of various works which you have written and published respecting the Republic. I have the great satisfaction of transmitting to you, through our Legation in Great Britain, and in obedience to the mandate of our Honourable Legislators, the well-merited offering, given by them to the distinguished writer whose pen traced, with upright impartiality, the picture of one of the most mournful periods of Peru. Receive, with the said offering, the sincere wishes of the Supreme Government for your personal happiness, together

with the protestations of high consideration and distinguished esteem with which I subscribe myself your attentive and sincere servant."

On one side of the medal are the arms of Peru and round them the words: "El Congreso del Peru. Lima, 1892;" on the reverse, "Á Clemente R. Markham," and round it, "Por sus trabajós historicos." The medal has some merit as a work of art, especially as coming from the mint at Lima.

Mr. Mackinder's Lectures on Geography and History.—The detailed programme of these lectures was given in our last number. As the place of meeting this session is likely to hold a very limited number, early application should be made for tickets.

Christmas Lectures to Young People.—The Christmas lectures to young people will be given this session, at the request of the Council, by Mr. Douglas W. Freshfield, in the hall of the Royal Medical Society, 20, Hanover Square. The subject selected by Mr. Freshfield, who is now the President of the Alpine Club, is "Mountains"; and the lectures will be fully illustrated by the oxy-hydrogen lantern. Further details will be found on the slip inside the wrapper.

The "Worcester" and "Conway" Examinations in Geography.—In 1882 the Council of the Royal Geographical Society resolved, with the consent of the Managing Committees of the *Worcester* and *Conway*, to hold examinations in geography on board each of those ships, and to give a prize, consisting of an atlas, to the cadet who gained the greatest number of marks. These examinations have been conducted annually by Mr. Coles, the Society's Map Curator. In 1885 Mr. Clements R. Markham, who was at that time Secretary of the Society, in his report to the Council, stated that the results had been very satisfactory, and a resolution in favour of their continuance was passed. At a meeting of the Council, Nov. 13th, 1893, Mr. Clements R. Markham, the President, again reported favourably on the results of these examinations, and that they had aroused an interest in geography, both on board the *Worcester* and *Conway*, that was absolutely wanting before. In the *Worcester* this has especially been the case, Mr. Buck, the headmaster, having himself compiled and printed little class-books for the use of his pupils, on the geographical subjects which have been set for the year. Since 1883 the subjects have been:—1884, Colonies; 1885, Australasia; 1886, South America; 1887, India; 1888, Arctic Regions; 1889, Africa; 1890, Asia; 1891, Mediterranean and Red Sea; 1892, Malay Archipelago; 1893, Arctic Regions (again); 1894, South America (again). The examination papers consist of fifteen questions, set by Mr. Coles. Maps are always required, and great pains have been taken by the masters in teaching to draw by eye, with excellent results. In order to stimulate the interest of the cadets, Mr. Markham has been in the habit of giving two lectures

annually on board the *Worcester*, and an occasional lecture on board the *Conway*. As the cadets are thoroughly trained in navigation, nautical astronomy, magnetism, and meteorology, there is every reason to expect that many of them will advance the objects of the Society in after years. In consequence of the President's favourable report, the Council have decided to continue these examinations, and Mr. Coles has been re-appointed examiner. Hitherto the best geographer only, in each ship, has received a prize from the Society, but a second prize, consisting of a telescope, will now be given in addition to the atlas, and the President has intimated his intention of presenting a third prize in each ship.

EUROPE.

Recent Travels in the Caucasus.—In recent numbers of *Globus* Dr. von Seidlitz communicates an account of M. Pastuchoff's visit to the mountain district described by Mr. Baker (See *Proceedings* XIII. (1891), p. 313) in south-eastern Daghestan. The traveller spent several days at Kurush (8175 feet), which is believed to be the highest village in the Caucasus. It numbers over four thousand seven hundred and fifty inhabitants, whose wealth consists in herds and flocks. Its elevation did not altogether protect it from cholera, which was fatal in thirty-six cases in 1892, but it suffered far less severely than the neighbouring villages at half its height. There are said to be several centenarians among its inhabitants, and the average duration of life is very high. This is not generally found to be the case in mountain regions, at any rate not where the human habitations are in valleys or positions cut off from sunshine during part of the year. Kurush appears to lie on an open upland. M. Pastuchoff ascended Shah Dagh (13,962 feet), a neighbour summit of Basardjusi, which supports two considerable glaciers, fed by snowfields lying on the summit of a wall of basaltic cliffs. The picturesque aspect of this mountain has been dwelt on by Dr. Radde and Mr. Baker. It had been visited by Russian surveyors, whose cairn was found on the top. M. Pastuchoff discovered a small lake, 100 yards long, not marked on the maps, near one of the glaciers. Possibly like many Alpine tarns in similar situations, *e.g.*, the Maärjelen See and the Ruitor Lake it is liable to be emptied by the escape of its waters by sub-glacial channels. On the whole, the opinion pronounced by Dr. Radde that this extreme eastern group of the Caucasus is of interest to the geologist and the botanist rather than to the lover of scenery or the mountain climber is fully confirmed by subsequent travellers.

Bathymetrical Survey of the English Lakes.—In continuation of the survey carried on by Dr. Mill and Mr. Heawood during the past summer, some of the smaller lakes were sounded at the end of October by Mr. E. Heawood, assisted by Mr. R. Shields. Ennerdale Water was first visited, and though operations were somewhat impeded by squally weather, fairly complete results were in the end obtained. This lake consists of a broad, shallow basin at the lower end, and an extremely regular deep trough occupying the upper two-thirds, the axes of the two being slightly inclined to each other. Near the junction of the two occurs the only island, a mere heap of stones, at which the deep water abruptly terminates. Crummock Water and Buttermere were next surveyed. In the former lake the phenomenon of steep shores and a nearly level bottom is particularly marked, for though the shores show much irregularity, at only one point does the 100-foot contour diverge to any great extent from the coast, the greatest depth obtained

being about 140 feet. This occurs in the lower (and also broader) half of the lake, a fact which is brought out still more strongly when we regard the upper lake of Buttermere as properly forming part of the same basin. The latter lake nowhere reaches a depth of 100 feet, the maximum, however, occurring quite at the upper end, where the two main feeders enter.

ASIA.

Mr. Littledale's Journey in Central Asia.—Mr. St. George Littledale has just returned to England from his journey through Central Asia. The following letter from Mr. Littledale, dated Peking, October 1st, 1893, will give some idea of what he has done:—We arrived here a couple of days ago safe, for if the Chinese carts had nearly thumped us to death, the inns, on the other hand, had made us very much alive. I wrote from Kurla (See *Geographical Journal*, November, p. 458). Just as we were starting, we found the Tarim and followed it down to the Lob. We then kept on the north side of the Altyn Tag, where I shot four wild camels. Here the first mortalities occurred amongst our live stock. Owing to treason and treachery in camp, we had to go to Saitu, where the Chinese Amban gave us a lot of trouble; and our own men, fearing to face another Altyn Tag, with tales of brigands thrown in, absolutely declined to go any further. We had a hard fight, but we gained our point, and kept along the north side of what Prjevalsky calls the Humboldt Range. The maps here are entirely wrong, and the Ritter Range, as put in some maps, does not exist. There is a range running in the same direction as the Humboldt, but a few miles south of it, with one, if not two peaks exceeding 20,000 feet, with fine snow-fields. We then crossed two or three passes, and reached the Bukhain Gol, and made our way to Koko Nor, Sining, and Lan-chow-fu. I made a map of the road as I went along, and took the Pole star for latitude. It being my first attempt at map-making, I hope it will not be viewed with too critical an eye; but, at least, it will have one merit of being strictly honest. We went down the Hoang-ho on a raft. On the upper part there are some gorges which are rather risky, but I think it is the best way of reaching the coast. We left the river where it begins its big bend to the south, and came in carts to Peking, where we arrived in rags and tatters. We had great trouble with our guides; they were utterly faithless, and their only object was to lead the expedition into trouble, hoping we should abandon our baggage, and then they would return and loot it. One time, when men and horses were *in extremis* through want of water, we caught our precious guides going secretly to a spring during the night, whose existence they had absolutely denied. The last part of the road we could not get any guides, and we made our own way. The horses were in a very bad condition when they reached Lan-chow-fu; nearly half had died on the road. The donkeys fared much better, but still their history was a "tale of woe."

The late Lieutenant G. C. Davison.—Readers of Captain Younghusband's narrative of his journeys on the Pamirs will remember his allusions (*Proceedings*, R.G.S., 1892, p. 229) to his companion, Lieutenant G. C. Davison, and will learn with regret of the death, in Astor, of that adventurous young officer. Captain Younghusband, now political officer in Chitral, writes as follows of his late companion:—"I have just heard of the sad death of poor Davison, who, you may remember, was my companion on the Pamirs in 1891. He is a great loss indeed, for I never knew a man with more solid pluck and perseverance. He positively did not know what a difficulty was. When I first saw him in Kashgar he had done one of the most extraordinary pieces of travelling I had ever heard of. But he was so innocent of having done anything out of the way, or gone through anything that might justly be called difficulties

that he only thought and spoke of what he called his 'failure' in not having reached the Mustagh Pass, which was the goal he had before him. And all the time he had performed almost the identical journey for which Hayward was awarded the Gold Medal of our Society; and though, of course, Davison could not compare with Hayward as a geographer, I am not at all sure that he had not to surmount as many and as great difficulties as that hardy and plucky explorer. For Davison had no time to make preparations or think about the best time for carrying out his intended journey. While stationed at Agra he suddenly found himself offered two months' leave, and he immediately started off to attack the Mustagh Pass. He had no time to get a proper map of the route he should have to follow; but he pushed on as hard as he could through Kashmir and Ladakh towards the Karakoram Pass, from which point he imagined that he would merely have to 'turn to the left' and he would see a long distinct range of snow mountains, with a gap in them which would be the Mustagh Pass. He had little idea of the pathless labyrinth of mountain that actually shut in this remote pass! Crossing his first pass between Kashmir and Ladakh he became snow-blind, and had to be carried across on a bed. At his second—beyond Leh—the Ladakis whom he had engaged struck work, and said the pass would not be open for ponies for weeks yet. But Davison, by more severe than diplomatic measures, managed to get both them and his ponies over. Then came the Karakoram Pass; and the only way to cross this in the month of May, when the snow on it was all soft and yielding, was by tediously laying down felts and blankets in front of the ponies for them to walk over, picking them up as they had passed over them, and again laying them down in front—and so on for mile upon mile. Those who have themselves had experience of trudging through soft snow at an elevation of 18,000 feet, can best realise what this must have been to a man who had come straight up from the plains of India, and who had never been on a snow mountain in his life before. Now came the crisis of the journey. Davison had no map to show him the way to the Mustagh Pass, and, still worse, he had no guide. He had not been able to find a single man who had been a yard off the beaten track to Yarkand; but he had a rough map which gave him the relative position of the Mustagh and Karakoram Passes; so he plotted those two points on a piece of paper, and then started a prismatic compass survey, which in future he plotted out regularly on the same piece of paper, and by these means he hoped to be able to make out his way to the goal he had before him. With this intention he followed down the stream which flows from the Karakoram Pass past Aklagh. But the further he advanced the more rugged and impracticable became the mountains which bounded in the valley in the direction of the Mustagh Pass. He could see nothing of that great snowy range which he had expected to find standing up conspicuous and distinct from all the rest, and with the Mustagh Pass forming a landmark which he could make out from any distance, and steer for without difficulty. Instead of this he found himself shut in by rocky precipitous mountains, which forbade him following any other route but that which led down the valley he was in. He had lost three ponies on the Karakoram Pass. Two of his men now deserted with most of his supplies. But Davison still pushed on in spite of the danger of doing so with his scanty stock of food till—very fortunately for him—he was pulled up on account of the stream having increased so much in depth that it had become unfordable. This was at Khoja Mohammed Gorge, about two marches below Chiragh Saldi. Davison tried to swim the river with a rope tied round his waist, but the stream was too strong for him. Finding it impossible to get down the valley at the time of year when the snows were melting and the rivers in flood, he reluctantly retraced his steps for a short distance and then turned north, crossed a pass (the Koka-long, if I remember rightly) which had not previously

been explored, and then finding ahead of him nothing but snow-fields and impracticable-looking mountains in the direction of Yarkand, he made his way back again to the valley of the Yarkand (Raskam) River, with the intention of making for Shahidula, the nearest point at which he could hope to get supplies. He was now at the last extremity; he had but one man, one pony, and supplies for a day or two. He then fell sick. He could not move. And in this plight he had to send away his sole remaining servant to find Shahidula, and bring some supplies and help from that place. As it turned out, he was nearer Shahidula than he thought. His servant reached there the same day, and on the following returned with food and a pony. Davison's difficulties were then over, and after resting a few days at Shahidula to regain his strength, he made his way rapidly to Kashgar. The ground that Davison covered had been previously explored by both Russians and English, but Davison had not the benefit of their experience; and the remarkable thing about his journey was that he accomplished it without any previous experience either of mountaineering or of ordinary travelling. A young subaltern, of only two years' service, he set out from the plains of Punjab, and by sheer pluck found his way, in the worst season of the year for travelling, to the plains of Turkistan, and this is a feat of which any one might feel proud." Lieutenant Davison belonged to the Prince of Wales' Leinster Regiment, the date of his first commission being 1888.

Statistics of Transcaucasia.—The Transcaucasian Statistical Committee has just published at Tiflis a "Summary of Statistical Information relative to the Population of Transcaucasia, abstracted from the Lists of Families made in 1886. It is an abstract of the rich material which has been collected in the second half of 1886, when lists of all families in all the villages and towns of Transcaucasia were made for administrative purposes. The original lists contain, for each village, the number of houses, the number of male and female inhabitants, their nationalities, religion and social position; the age, language spoken, education and occupation of all male inhabitants; and the properties owned by the villages and towns. Several volumes of the Statistical *Vrenrennik* of the Caucasus have already been published, containing the statistics of separate districts of Caucasia; but in view of more rapidly utilising the above-mentioned lists, the present Summary is brought out. Its geographical value has been enhanced by a thorough revision of the names of all villages which were often incorrectly given both on maps and in official publications. An alphabetical index having been added to the present volume, it thus represents a quite reliable gazetteer of Transcaucasia, which comprises the governments of Tiflis, Kutais, Erivan, Elisabethpol and Baku, the two provinces (*oblasts*) Daghestan and Kars, and the two independent military districts, Zakataly and Chernomorsk. The total population of Transcaucasia was, in 1886, 4,702,898 (489,866 in towns, military not included), who are settled in 9942 villages.

AFRICA.

Origin of the name Bangweolo: Progress in British Central Africa.—Mr. Alfred Sharpe writes as follows from Blantyre, British Central Africa, August 23rd, 1893, with reference to the name of Lake Bangweolo:—"A word which has always puzzled me much has been Bangweolo. There is nothing African at all about it, and I have never yet found any native north or west of Bangweolo Lake who knew anything of the name. It was only the other day in pronouncing it over and over again in all sorts of ways that I suddenly dropped on what I feel sure is the solution of Dr. Livingstone's name for that lake. South and south-west of Tanganyika, all lakes are called Mweru or Mwero, or Mwelu or Mwelo. 'Pa' means

'at.' Kazembes Lake is frequently spoken of as 'Pamwelo'—'at the lake.' I think that the natives have spoken to Dr. Livingstone of the Awisa Lake as *Pamwelo*, which, if it is true, will be found to sound very like Ba-ngwelo. The natives on the Luapula, five days west of 'Bangweolo,' always speak of it as the Mweru or Mwelu or Mwelo." Mr. Sharpe adds: "I have been rather expecting to get away in the direction of Bangweolo and the Luapula this year, but am afraid it is not very likely now—we are very busy here and work is increasing always—things are progressing and planting operations are taking great strides, and the prospects of the country look really promising."

The Somali Coast Protectorate.—In his Foreign Office report on the trade and commerce of the Somali Coast Protectorate for 1891–92 (Annual Series, 1893, No 1208), recently issued, Lieut.-Col. Stace gives some notes on the country and people which are of interest. The Somali Coast Protectorate extends from Lahadu (or Lewádu), which is half-way between Jibuti and Zaila to the 49th parallel of east longitude. The nature of the country is for the most part mountainous. On the east the mountains come close down to the sea. Towards Berbera and Bulhar they recede, leaving a maritime plain of varying breadth from a few miles to 30 or 40. Still further west to the south of Zaila the mountains are more distant, and the Zaila-Harrar road gradually ascends across the plain until the high lands are met with about Gildessa. The great Golis range, about 6000 feet high at the loftiest parts, runs for many miles parallel to the coast to the south of Berbera, and at a distance of between 40 and 50 miles. There are no rivers, properly speaking, but water-courses are numerous. The plains are generally thinly covered with scrub, jungle and babul bushes; along the water-courses and for some distance on either side this becomes real jungle, with frequently trees of considerable size. On the coast and in the maritime plain the seasons may be divided into the "hot weather" and the "cold weather"; from October or November the east or north-east wind is most prevalent; after April, for two or three months, the hot wind blows strongly from the south-west. Rain falls generally during the cold weather, but the amount is small and insufficient for cultivation. The climate on the whole is considered very healthy. The whole of the Protectorate is inhabited by various Somali tribes, split up into numerous sub-tribes and clans. The tribes are nomadic. Within the Protectorate there are only three or four small villages in the interior, and a few settlements of mullahs or priests. Cultivation is practically unknown, except that of jowari (*Sorghum holcus*), on a very small scale at the above places. The people are very averse to manual labour, but make good boatmen and sailors. They are described as cheerful, volatile, inclined to pilfer, idle to a degree, not wanting in courage, and of a very independent bearing. They are very intelligent, and make good linguists. There appears to be no means of forming an estimate of the population of the Protectorate. Berbera is supposed to contain about 30,000 people during the principal trading season, Bulhar perhaps 5000, and Zaila 6000.

Agricultural Condition of Algeria.—Sir R. L. Playfair's Report on the Agriculture of Algeria for the years 1891–92 (Foreign Office, 1893, Annual Series, No. 1196) contains much interesting matter. At the end of 1891 the agricultural population of Algeria consisted of 3,413,122 persons—viz., 198,975 Europeans, and 3,214,147 natives. Although viticulture has greatly extended of late, cereals remain the chief production of the country. Roughly the amount of land under cultivation with cereals is 7,000,000 acres. The total extent of land under cultivation with vines in the three departments of Algeria—viz., Algiers, Oran, and Constantine—during 1891 was about 273,600 acres. Agricultural prosperity in Algeria is invariably in proportion to the amount of rainfall, and especially to the

quantity which falls at the opening of the season. In 1890, 17·50 inches fell in December (the station where the record was kept is not mentioned), so that when the land was sown it was thoroughly saturated, and the harvest of 1891 was excellent. In December 1891 there was only 0·60 inch, with the result of a bad harvest in 1892. Owing to the conditions of rainfall it is feared that the harvest of 1893 will prove a complete failure. In many parts of Algeria the soil seems to be well adapted for the cultivation of fruit. In places situated at 1500 or 2000 feet above the sea, almost all the fruits of Europe might be cultivated with success. The forests of Algeria are of great importance and value to the country. The climate, the water-supply, the whole prosperity of the colony, depend on the preservation of what remains, and replanting what has been destroyed. The total area covered with forest, including much that is mere brushwood, is 7,614,230 acres. Of the products of these forests, the only tree of any considerable economic value is the cork oak, which is only found here, in the South of France, in Spain, Corsica, Sardinia, Portugal, Sicily, and Tunis, or in the Mediterranean region between 34° and 45° north latitude. In a country like Algeria, so entirely dependent on a precarious rainfall for prosperity, irrigation works are of great importance. The three chief irrigation works in the Department of Oran which have been lately visited by Sir Lambert Playfair, and of which he gives a short description in his report, are the barrage of the Cheurfas, near St. Denis du Sig; the barrage of Wed Fergug, which crosses the valley of the Habra below the confluence of that river with the Wed Fergug, 7 miles from the town of Perrégaux; and the barrage of the Jidonia, about 4½ miles from the village of St. Aimé.

AMERICA.

The Alaska Boundary Commission.—The reported disagreement between the respective Commissioners on the Canada-Alaska Boundary Survey must, there is reason to believe, be incorrect. Different views are held on each side as to the meaning of the treaty, but the present operations in the field are directed to the joint survey of the whole region of the "coast strip" where the differences are known to exist. No authoritative line of boundary is at present being marked on the ground. The Canadian parties have now returned to Ottawa for the winter. For mountain features they have employed the photographic method of survey perfected by Captain Deville (Surveyor-General), and notwithstanding the cloudy character of the atmosphere in the coast ranges, they have been very successful.

AUSTRALASIA AND POLYNESIA.

Australian Deserts.—Mr. Ernest Favenc sends a note on the future habitability of the Australian desert. He does not regard the desert as hopelessly unproductive territory, though he admits that it is only by the continuance of the artesian water-supply across the continent that it can be reclaimed. The characteristic growth of the desert land is the prickly grass known as spinifex, which, on the flats, plains and downs, is softer and not so uncompromisingly hostile as on the stony ridges. It is not because the soil is poor, but simply on account of the rainlessness of the climate that the spinifex is so universal; it is the only possible form of vegetation in a country where one rainless year follows another. Where there is any moisture at all a good growth of grass at once takes place. An interesting question is whether the filling up of the shallow lake beds, blind creeks and clay pans with water would have any permanent effect on the climate. If that vast mud-flat, misleadingly portrayed on maps as Lake Amadeus, were filled with water, would it not, even after it became salt, as it certainly would become, render at least the nights dewy and moist? The introduction of the date palm has

already been fairly successful. The western interior must not be regarded as permanently given over to spinifex and desolation. The soil is there, and with the introduction of water would at once teem with vegetation. There is no reason why the Australian desert should not be turned into a garden, like many places in the Sahara and in America, provided only the essential water-supply is obtainable from deep wells.

Marshall Islands.—In the October number of *Petermanns Mitteilungen*, P. Langherns, the compiler of the "Deutscher Kolonial Atlas," begins a series of short notes upon some parts of the German colonies for which he has in hand various information that could not be utilised in the atlas. The first note deals with the Jaluit Atoll, on which the station Jabor is situated. It belongs to the Jaluit Society, which has its stations on fifty-four other islands belonging to the Carolines, Marshall and Kingawill (or Gilbert) archipelagoes. Coco-nut plantations already cover 1380 acres on the islands Kili, Ujelang, Ligieb, and the island of Jaluit. Three small detail-maps of Jabor are given.

POLAR REGIONS.

Dr. Nansen's Arctic Expedition.—The last number of the *Izvestia* of the Russian Geographical Society, contains the following two letters exchanged between Dr. Nansen and Rear-Admiral Makaroff. The Russian admiral wrote to the Norwegian ambassador at St. Petersburg as follows:—"I have read with great interest the report you kindly forwarded to me of Dr. Nansen's communication, 'How can the North Polar Region be Crossed?' I agree with Dr. Nansen's scheme in one, the most essential point—namely, that if he trusts himself to the ice-drift he will be carried through regions not yet visited. Whether he will be carried across the Arctic Ocean, as Nansen supposes he will, or along a parallel as I believe—at any rate, his journey will enrich science with new geographical and meteorological data. Dr. Nansen must know that in one year or two after his departure there will be an anxiety about him, and the idea will be afloat that expeditions must be sent in search of the fearless traveller. I should think that in 1894 a good strong small-decked boat must be sent with provisions to Franz Josef Land. We cannot at present be certain that such a relief expedition will be sent out; but it would be desirable to agree beforehand on some spot on Franz Josef Land on which a signal might be erected in order to indicate to Nansen where he may find a boat and provisions. In order to facilitate the work of the searching expedition, Nansen ought to make it a rule to place signals along the route he will follow. Like the *Jeannette*, Nansen's ship may be carried past several islands. It would be most desirable that Nansen should leave on those islands some visible signals under which information as to the route covered, the state of the ship, and the ulterior schemes of the expedition may be found. A journey so adventurous as this will necessarily inspire other young and gallant explorers with the desire of going out to find Dr. Nansen, and it is necessary therefore that, before leaving, he agrees upon all means that might be helpful for searching parties." Dr. Nansen replied by the following letter:—"Permit me to express to you my hearty thanks for the keen interest you took in my expedition. I was extremely glad to read your letter to Ambassador Reuterskjöld, in which, so far as I understand, you agree with me as regards the currents and the state of ice in the Polar Ocean. As you justly remark, we may strike the shores of Franz Josef Land, or of some other lands situated further east. Wherever we shall be able to approach the coast, I propose to leave cairns in which records of the expedition will be placed, telling what has been done and what is proposed to be done. On the top of each cairn we shall put, if possible, a pole with some signal (probably a Norwegian flag)."

The State of the Kara Sea.—Mr. Ernest C. F. James, who acccompanied the small fleet of vessels that sailed last summer for the Yenisei with rails for the Siberian railway, sends some interesting notes on the condition of the Kara Sea. Mr. James writes:—Any reports of a mishap to Nansen's ship must be without the slightest foundation. We have just returned from Golchika on the Yenisei River in Mr. Popham's s.s. yacht *Blencathra* (late *Pandora*, belonging to Sir Allen Young). We have thus crossed the Kara Sea twice this year. In going out we were only ten days behind Nansen. At the end of last year, when Dr. Nansen was staying with Mr. and Mrs. Popham at Littlecote, Mr. Popham offered to put his auxiliary s.s. yacht the *Blencathra* at Dr. Nansen's disposal to carry coal or any stores he might require as far as possible. Dr. Nansen did not avail himself of Mr. Popham's offer. Still Mr. Popham took 100 tons of coal for Nansen in case we came up with him. We arranged with Captain Wiggins to take the *Blencathra* as far as Golchika on the Yenisei, and to ascend that river in a steel light draft river yacht, which is now at the town of Yeniseisk with Captain Wiggins, 1500 miles up the Yenisei River. The Russian Government asked us to bring out rails for the Trans-Siberian Railway. We got a large iron steamer to carry the rails, and the Russians also sent two small river steamers, one a paddle, and also an iron sailing schooner to carry coal for their two steamers. These six vessels all crossed the Kara Sea, and arrived safely on the Yenisei. On July 25th, we, *i.e.* Mr. F. W. Leyborne Popham (owner), Mr. and Mrs. E. C. James, and Miss Peel, left Appledore, North Devon, in the auxiliary s.s. yacht *Blencathra*, 450 tons. On August 27th, after a pleasant passage, we arrived off Waigatz Island, and anchored in Pet Straits. We found three Russian vessels here, and a Russian man-of-war. An officer from the man-of-war came on board with a civil message from the admiral that Nansen had passed through ten days before all well. On August 29th we started at 5 A.M., and anchored at Khabarova, about 4 miles to east of where we lay. We (six vessels in all) started about 2 P.M., and got into the Kara Sea. The weather was clear and fine, and any floating ice met with presented no difficulty. On September 2nd we passed close to the island off Dixon's Haven, and proceeded up the Yenisei River. To show how calm it was in the Kara Sea, I may mention that our swing table was fixed all the way from Pet Straits. The prevailing winds were northerly and easterly, which probably cleared the ice away for Nansen. We arrived at Golchika on the Yenisei on September 3rd, and remained there till September 20th discharging rails, when we commenced our return voyage. The loose ice presented no difficulty, and on September 25th we anchored at Khabarova. We left on the 26th, and arrived at Arkhangel on September 30th. We left Arkhangel on October 12th, and arrived at Dundee on November 7th. I feel sure from what we saw in the Kara Sea that there was absolutely nothing to interfere with Nansen's voyage, and I am sure that Captain Wiggins, who is at Yeniseisk, will, on his return, confirm all I have said. This voyage is remarkable for two things. It is the first time that rails have been taken by sea to the centre of Siberia, and it is also the first time that ladies have ever crossed the Kara Sea. I trust their having done so will confirm the feasibility of the sea route to Siberia. I may state that Mr. F. J. Jackson came out as a passenger in the *Orestes*. He was landed at Khabarova on August 29th. When we returned, we called again at Khabarova on September 29th. Mr. Jackson had been to Waigatz Island. Mr. Popham gave him a whale-boat, in which Mr. Jackson proposed to go along the coast eastwards from Khabarova, no doubt with the intention of reaching the Yalmal Peninsula. He then intended to return to Khabarova, and proceed to Arkhangel by the Pechora River.

GENERAL.

The Spoon of an Elizabethan Navigator.—When Cavendish sailed on his last voyage in August 1591, there were included in his fleet the *Desire*, commanded by Captain John Davis, the great Arctic discoverer, and the *Dainty*, a barque belonging to Adrian Gilbert (half-brother of Sir Walter Ralegh) and commanded by his intimate friend Captain Randolfe (or Randall?) Cotton. On March 16th, 1592, Captain Cotton had gone on board one of the other ships to dinner, the fleet being at anchor in one of the ports of Patagonia, when the crew of the *Dainty* got her under weigh and made sail for England. Captain Cotton was left with nothing but the clothes he had on. Being a very old friend of Captain Davis he was taken on board the *Desire* as a guest, and so remained during the remainder of the voyage. Captain Cotton was on board the *Desire* in Magellan's Strait in May 1592, and again in October, gales of wind preventing Davis from entering the Pacific on both occasions. Cotton shared the dreadful sufferings of Davis and the crew on the passage home. All the men died of scurvy but sixteen, and of these only five could move. Davis and one boy were in health, Cotton and Mr. Jones, the narrator of the voyage, very ill but able to work. These four brought the ship home, always "mightily and monstrously grieved with the most wofull lamentation of our sick men." On June 11th, 1593, they ran the ship on shore at Berehaven, in Bantry Bay. Davis and Cotton took passage in a fishing-boat, and eventually landed at Padstow, in Cornwall. In the following year, 1593, Cotton joined the expedition of Captain Lancaster against Pernambuco, and was killed in an attack on that town. By a very strange chance, a spoon which was made for Captain Cotton on board the *Desire*, in Magellan Straits, has been preserved among the plate of the Cotton family of Etwall, in Derbyshire. The Rev. R. G. Buckston, of Sutton-on-the

Hill, near Derby, inherited plate once belonging to the Cottons of Etwall, and amongst it was this curious spoon made in Magellan's Straits 300 years ago. Along the handle and back of the spoon is the following inscription:—

"In clyming hye there was a fall. But yet except the good will of us all
Thoughe fortune frownde against our wil; yet hope i wel and wil doe stil,
for in the straightes of Magalan Captain Cotton so called by name
Caused me to be maid in ye month of maye 1592: it is trew yt i saye."

[C. R. M.]

A Monument to the late Dr. Rae.—A movement has been set on foot for the erection of a monument to the late Dr. John Rae, the well-known Arctic explorer, in St. Magnus Cathedral, Kirkwall, Orkney. Dr. Rae was a native of Orkney, and his remains have been interred in the churchyard of St. Magnus Cathedral. Subscriptions should be sent to the Secretaries (Mr. J. W. Cursiter and Mr. Duncan W. Robertson), Rae Memorial, Kirkwall, Orkney, N.B.

CORRESPONDENCE.

The Determination of Longitudes and Photography.

Dr. Schlichter, in his interesting paper on the 'Determination of Longitudes by Photography' (*Journal* for November, p. 423), says quite truly that in my Presidential address at Cardiff, when dealing with the progress in the art of Surveying, I stated that "the photogrammeter had not as yet been utilised for ascertaining the relative positions of celestial bodies." What I said then is true still, for although Mr. Stolze, and probably others, have repeatedly proposed to take lunar and other astronomical observations by photography, we have scarcely as yet got beyond the experimental stage, and I am not aware that a single determination of that nature has been made in the field.

I quite agree with the leading practical surveyors in their condemnation of the sextant for astronomical work on *terra firma*. The sextant owes its popularity among explorers to its portability and cheapness, but even in skilful hands the results which it furnishes are mere approximations. As far as lunar distances are concerned the photogrammeter, that is a photographic camera constructed with especial view to the requirements of the surveyor, is undoubtedly far preferable to it. The capacities of this instrument have been fully tested, quite a number of patterns of it can be had of continental makers, and it has already rendered good services in the field. Books like Koppe's *Photogrammetrie* (Weimar, 1889) tell us all about the principles of its construction, the manner of determining and eliminating its errors, and the method of computing the angles by measuring distances between the objects photographed, and so forth. The instrument described by Dr. Schlichter is in fact nothing but a "photogrammeter;" and an instrument of this description, of smaller size and lighter make (in bellows-form) than needed for astronomical observations, might profitably be included in the outfit of every traveller.*

If a set of lunars were sufficient to compute a longitude, no better instrument could be desired; but as the observer has to determine the local time as well, he must be furnished in addition with a sextant or theodolite, or, and this would perhaps be preferable, with a photo-theodolite.

This would prove no objection if lunars afforded the only or even the best method of determining a longitude. This, however, is not the case, for there are other methods which yield excellent results, and call for no more skill on the part

* An ordinary camera could easily be adapted to do duty for a photogrammeter.

of the observer than that required for determining the local time. Among these are lunar-zenith distances, equal altitudes, and the method of moon-culminating stars, which last possesses the great advantage of being quite independent of a knowledge of either local or Greenwich time. All these observations can be made with a theodolite, and even lunars might be observed with this instrument if a photo-telescope were to be substituted for the ordinary one. The theodolite is nearly as portable as a sextant of equal power; it is no more liable to injury, and, what is of great importance, its proper use is easily acquired after a short practice.

Of recent years quite a number of longitudes have been satisfactorily determined in Africa by the methods referred to, and the results would have been even better had the explorers condescended to familiarise themselves to a greater extent with their instruments before they started on their travels.

It has been proposed to supersede the ordinary theodolite by a photo-theodolite.* It is claimed, on behalf of this instrument, that astronomical observations of every description (including lunars) can be made with it. This is literally true, but as most altitudes must be read off on a vertical limb the results can under no circumstances be more exact than those obtainable by an ordinary theodolite. As this new instrument is moreover rather cumbersome, explorers will be well advised if they confine themselves to the theodolite, which enables them to do efficiently all the work that is required of them.

E. G. Ravenstein.

"*The Trade.*"

In the sixteenth century some part of the Breton Sea—apparently the fairway off Ushant—was called "the Trade." It is repeatedly mentioned in the first volume of the Calendar of State Papers for Henry VIII. Here are some instances:—

November 17th, 1511. No. 1980.—The Kings of Aragon and England agree "to keep the sea from the Trade to the mouth of the Thames."

1513. No. 4038.—The same two kings agree "to send to sea a sufficient navy, viz., three thousand men on the part of England to protect the Channel between the Trade and the mouth of the Thames, with three thousand on the part of Aragon for the parts beyond the Trade."

Other instances are Nos. 1512, 3243, 3877, 4005, 4019, 4020, 4056, in some of which it is spoken of as "before the haven of Brest," or as, apparently, to seaward of "the Broad Sound before St. Matthew's." I have no note of the term in the Paston Letters, nor does it occur in any of the later Calendars; but within these last few days, in the course of editing the naval papers of 1588 for the Navy Records Society, I have met with it in the letters of Sir William Wynter. Wynter had then been at sea for fifty years, more or less—he served in the expedition to Leith in 1544—and his language may have been a little old-fashioned; but in a letter to Sir F. Walsyngham of June 20th, he says—"There arrived at Dunkirk lately certain Brittany ships, whose mariners should give out that they came in company from Cape Finisterre with 150 ships of war of the king of Spain's, and how that they parted from them upon the coast of Brittany near the Trade; since which time we have had perfect intelligence that the Queen's Majesty's ship, the Elizabeth Bonaventure, hath been within the Trade and thereabouts. Likewise we have spoken with the masters and company of three flyboats . . . that were in Rochelle five days past, and came along all the coast of Brittany and through the Trade. . . ."

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* A very elegant 5-in. photo-theodolite is described in Dr. Koppe's book. It packs into a box 21 inches long and 12 inches high. This box serves as a "dark room" for developing the plates, and contains everything needed for photographic purposes. Lechner, of Vienna, sells an eight-inch photo-theodolite, weight 19 pounds, for £45.

Neither Howard, nor yet Drake, Fenner or others of the seamen in the fleet speak of the Trade, though they repeatedly mention Ushant—or, as it often appears, Yewshante; and Sir George Carey, writing to the Earl of Sussex from the Isle of Wight, on July 25th, says, "The fleets keep the direct trade and shot into the sea out of our sight;" where "the trade" would seem to mean "the fairway of the Channel."

My impression is that the earlier term "the Trade" applied in a general way to the sea off Ushant, as the point to which all the routes of the old *trade* to Bordeaux converged; but I should be very grateful for any clear and distinct information on the subject, and for any reference to its use earlier than 1512, or later than 1588.

J. K. LAUGHTON.

OBITUARY.

Captain J. LYONS MCLEOD, R.N., died on October 25th. He entered the navy in 1841, was appointed British Consul at Mozambique in 1856, and remained there until 1858. At that time the slave trade was carried on most actively on the east coast of Africa, and not only many of the Portuguese officials from the governor-general downwards, but also Frenchmen and others openly engaged in it. The British Consul naturally fell under the displeasure of those who profited by the slave-trade; his house was attacked, and his wife nearly died of poison administered by a physician who had been called in professionally. It was greatly to the fearless exposure of the state of affairs by the British Consul that matters began to mend. In 1866–69 Captain McLeod held the appointment of Consul on the River Niger. He was the author of 'Travels in Eastern Africa' (London, 1860); of 'Madagascar and its People' (1865); of "Notes on the Zambesi from Quillimane to Tete," published in our *Proceedings* (1858 p. 363); and of a number of valuable official reports.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1893-94.

First Ordinary Meeting, November 13th, 1893.—CLEMENTS R. MARKHAM, Esq., C.B., F.R.S., President, in the Chair.

The PRESIDENT made the following remarks on taking the Chair:—

As this is the first time I have had the pleasure of addressing you as your President, I take the opportunity of saying that it will be my plan so long as I occupy this Chair to inform you promptly and fully of everything that is likely to interest you, and of every measure that is adopted by our Council, at the evening meetings, and it will also be my endeavour to prevent any difference even of the slightest kind from arising between our Council and the fellows. I was brought up at the feet of Sir Roderick Murchison, the greatest of our Presidents, and I shall endeavour to follow in his footsteps. I shall remember his conviction, which is also mine, that the most important point for the welfare and well-being of this Society is that there should be complete accord between the Council and the great body of the fellows. I have pleasure also in announcing to you several measures that have been adopted within the last year, and which, I trust, will redound to the usefulness and credit of the Society. As you are aware, at the beginning of the present year the monthly publication assumed a new form; not only was it to have a more attractive appearance, but it was so planned as to be in fact a monthly geographical magazine embracing the whole field of Geography. Testimonials from all hands, both from the press and from individuals of eminent position at home and abroad, assure us that the enterprise of this Society in carrying out one of its main objects, the diffusion of geographical knowledge, has been most successful. The sale of the

Journal to the general public is steadily increasing, and this, combined with the increasing number of advertisements, will, it is hoped, in course of time more than cover the extra expenses. With the new year, 1894, our Supplementary Papers will assume a new and more attractive form, with a result, it is hoped, of increasing the sale outside the Society; we have several very important and interesting works on hand to be issued in this form, as the funds of the Society admit of it. Our librarian, Dr. Mill, has been giving a course of lectures, under the Society's auspices, at the London Institution, on Geography as applied to Commerce; and though the fee charged is small, the attendance is so satisfactory that it is hoped the expenses of the lectures will be covered. The second course of a series of lectures by Mr. Mackinder, on Geography and History, will be given in the beginning of the new year. The lectures for young people at Christmas have been kindly undertaken by our Secretary, Mr. Freshfield. Last year the expenses were more than covered, and this year I have no doubt they will be equally successful. I may mention, also, that during the year we have established the most friendly relations with all the other geographical societies in the Empire—both Great Britain and the Colonies, so that any fellow of the Royal Geographical Society will always find a welcome among our sister institutions. Last month I visited the Geographical Societies of Tyneside, Liverpool, and Manchester, and opened their sessions by reading papers. I experienced most cordial receptions; and I can testify, from personal observation, that these societies are flourishing, and are likely to do much good. You may also be interested to know that a complete new catalogue, arranged according to authors, is in an advanced state of preparation, and at the same time an exhaustive subject-catalogue is in hand, and when complete will be of invaluable service to all interested in geography.

The PRESIDENT then delivered his opening address.

There was the usual reception, and an exhibition of recently-acquired photographs, atlases, etc., in the tea-room.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. R. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, &c., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half inch. The size of the *Journal* is 10 × 6½.

EUROPE.

British Islands. **Bartholomew.**

Gazetteer of the British Isles, Statistical and Topographical. With Census Supplement, 1891, and appendices. Edited by John Bartholomew,

F.R.G.S. Edinburgh, John Bartholomew & Co. [1893]: size 10½ × 7, pp. iii., 670, and xxxii. *Price* 12*s.* 6*d.* *Presented by the Publishers.*

The only changes in this useful book of reference from the former edition published by Messrs. A. & C. Black (see *Proceedings* **9** (1887), 205) are the reduction of price to one-third, the omission of the twenty-three maps and of many of the statistical appendices, and the addition of a tabular statement of the census of 1891, and agricultural and commercial statistics.

France—Surveys.

Ministère de la Guerre. Service géographique de l'Armée. Rapport sur les Travaux exécutés en 1892. Paris, 1893: size 9½ × 6½, pp. 20.

Germany—Pommerania. *Globus* **64** (1893): 237–241. **Deecke.**

Ueber Dünen und Diluvialsande auf den pommerschen Inseln. Von. Prof. W. Deecke. Greifswald.

An interesting notice of the sand-dunes along the Baltic coast, showing the importance of wind action on glacial-drift and river-borne sand in modifying the configuration of the coast-lands. There are two maps of typical dune-formations.

Greece. **Bædeker.**

Greece. Handbook for Travellers. By Karl Bædeker. Second revised edition. Leipsic, Karl Bædeker. London, Dulau & Co., 1894 [1893]: size 6½ × 4½, pp. cxii. and 376. *Maps and plans.* *Price* 8 *marks.* *Presented by Messrs. Dulau & Co.*

Several new maps and plans have been added to this edition.

Iceland. **Grossmann.**

Observations on the Glaciation of Iceland. By Karl Grossman, M.D. Size 9 × 5½, pp. 12. *With map and plate.* *From the "Glacialist's Magazine" for September.*

The author visited Iceland in 1892 with the special object of studying the glacial phenomena of the island. His route led north from Reykjavik and then eastward parallel to the north coast.

Ireland—Aran Isles. *P. R. Irish A.* **2** (1893): 768–830. **Haddon and Browne.**

The Ethnography of the Aran Islands, County Galway. By A. C. Haddon, Professor of Zoology, Dublin, and C. R. Browne, M.D.

A valuable study of one of the most insular peoples of the British islands, illustrated by a number of characteristic photographs.

Lipari Islands. [**Ludwig Salvator.**]

Die Liparischen Inseln. Erstes Heft: Vulcano. Size 16½ × 13, pp. xii. and 96.

Zweites Heft. Salina. Size 16½ × 13, pp. x. and 72. Prag, Heinrich Mercy, 1893. *Presented by the Author, the Archduke Ludwig Salvator.*

These singularly gorgeous volumes, worthy of exhibition as specimens of the highest art of the paper-maker and printer, are illustrated by numerous engravings, and there are maps of both islands. A special notice must be devoted to their geographical aspects.

Portugal and Spain. **Boutroue.**

Rapport a M. le Ministre de l'Instruction publique et des Beaux-Arts sur une Mission Archéologique en Portugal et dans le sud de l'Espagne. Par M. Alexandre Boutroue. Paris, E. Leroux, 1893: size 10 × 6½, pp. 57. *Plates.* *Presented by the Author.*

Russia—Duna. **Sapunov.**

The River Western Duna (*Ryeka Zapadnaya Dvina*), historical and geographical sketch. By Y. Sapunov. Vitebsk, 1893: pp. 512. *With many maps.*

The author, who is a well-known explorer of West Russian antiquities, has collected in this bulky volume all that is known on the river and the chief places on its banks. A full geographical description of the Duna, its tributaries, canals, sand-banks, islands, flora, and fauna is given, and it is followed by most valuable historical data and archæological descriptions of towns, castles, &c.

ASIA.

Arabia—Yemen. **Harris.**

A Journey through the Yemen, and some general Remarks upon that Country. By Walter B. Harris. Illustrated from sketches and photographs taken by the author. Edinburgh and London, William Blackwood & Sons, 1893: size 8½ × 6, pp. xii. and 386. *Price* 16*s*. *Presented by the Publishers.*

Mr. Harris had an adventurous time in Yemen, crossing the Turkish frontier in disguise, and expiating his rashness by a very unpleasant imprisonment. He was successful in reaching Sanaa, the capital of the Yemen from Aden, and returned under escort to Hodeida. Apart from the narrative of his personal travels, Mr. Harris gives a brief summary of the geography and history of Yemen. Numerous illustrations enhance the value of the book, which is also furnished with a sketch map of the author's route.

Asia-Minor. *Globus* **63** (1893): 349–354, **64** (1893): 153–158, 196–202. **Belck.**

Untersuchungen und Reisen in Transkaukasien, Hoch-Armenien und Kurdistan. Von Dr. Waldemar Belck.

Baluchistan—Quetta. ——

The Quetta Directory for 1893. As compiled by the late Mr. R. R. Golwala, and published by R. R. Golwala & Co. Quetta, 1893: size 9 × 6½, pp. 152. *Presented by Major R. B. Burnaby.*

Includes a brief sketch of Baluchistan, its extent, physical features, productions, population, geographical divisions, including Persian Baluchistan, Kalati, Baluchistan, and British Baluchistan.

India—Darjiling and Sikhim. **Waddell.**

Place- and River-Names in the Darjiling District and Sikhim. By L. A. Waddell, M.B. [*From the Journal of the Asiatic Society of Bengal, vol. lx., part i., No.* 2, 1891.] Pp. 27. *Presented by the Author.*

India—Islands. *J. Asiatic S., Bengal* **62**, *Pt. II.* (1893): 39–86. **Prain.**

On the Flora of Narcondam and Barren Island. By D. Prain.

Narcondam and Barren Island lie in the Andaman Sea, east of the Andaman Islands. Mr. Prain's paper is of geographical as well as botanical importance, and will be summarised in the Monthly Record.

India—Rájputána—Currencies. **Webb.**

The Currencies of the Hindu State of Rájputána. By William Wilfrid Webb, M.B. London, A. Constable & Co., 1893: size 10½ × 6½, pp. xxi. and 135. *Presented by the Publishers.*

Illustrated by a map showing the mint towns of Rájputána, and by twelve plates of coins.

India—South Bihar. **Waddell.**

On some new and little-known Hot Springs in South Bihar. By L. A. Waddell, M.B. [*Reprinted from the Journal of the Asiatic Society of Bengal, vol. lix., part ii., No.* 3, 1890.] Calcutta, 1890: size 9 × 6½, pp. 13. *Presented by the Author.*

India—Surveys. **Hill.**

Trigonometrical Branch. Survey of India. Spirit-levelled heights. No. 7. Bombay Presidency, Hyderabad Assigned Districts, and Central Provinces. Seasons 1890–92. Prepared in the Office of the Tidal and Levelling Party by Lieutenant-Colonel J. Hill, R.E., under the directions of Colonel G. Strahan, R.E., Deputy Surveyor-General, Trigonometrical Branch. Published under the orders of Colonel H. R. Thuillier, R.E., Surveyor-General of India. Dehra Dun, 1893: size 9½ × 6½. *Plate. Price* 1 *rupee. Presented by the Survey of India.*

Japan—Geology. **Naumann.**

Neue Beitrage zur Geologie und Geographie Japans. Von Dr. Edmund Naumann. Gotha, Justus Perthes, 1893: size 11 × 8, pp. 46. *Maps. Price* 3·60 *marks.*

Erganzungsheft No. 108 of *Petermanns Mitteilungen.* Dr. Naumann first deals with the explosive eruptions of Shirane and Bandaisan, then details the geological structure

of the central area in the main island known as the *fossa magna*, discussing its relation to orogenic agencies at work in Japan, and finally he describes, with an effective contoured map, the orography of the whole Japanese group.

Malay Archipelago. **Pictet and Bedot.**

Camille Pictet et Maurice Bedot. Compte Rendu d'un voyage scientifique dans l'Archipel malais. Genève, A. Cherbuliez, 1893: size 10 × 6½, pp. 64. *Presented by Professor Paul Chaix.*

Sketch of a zoological sojourn in the Malay Archipelago in 1890, with lists of equipments which were found useful on the trip. This is an introduction to the detailed study of the terrestrial and marine fauna, which it was the object of the Swiss naturalists to collect and describe.

Palestine. **Dickson.**

Report on the Jaffa-Jerusalem Railway (with plans). Foreign Office Reports, 1893. Miscellaneous Series No. 288. Turkey. By Consul J. Dickson, Jerusalem. Size 10 × 6, pp. 8. *Price 7d.*

A short account of this railway was given in the *Proceedings*, Vol. XIV., p. 801. The present Report is valuable on account of its map of the whole line on a large scale. One passenger train and one goods train run each way daily between Jaffa and Jerusalem. In addition to the plans for extending the railway mentioned in the note referred to, the project of carrying the line on to El-Arish and thence possibly to join the Egyptian railways has been discussed. The feasibility of carrying a line from El-Arish to Akaba in connection with a new route to India has also been spoken of.

Pātaliputra. **Waddell.**

Discovery of the exact Site of Asoka's Classic Capital of Pātaliputra, the *Palibothra* of the Greeks, and description of the superficial Remains. By L. A. Waddell, M.B. Calcutta, Bengal Secretarial Press, 1892: size 11 × 8½, pp. 29. *Map, plate, and plans. Presented by the Author.*

Mr. Waddell claims to have discovered the exact site of Pātaliputra, which he places in the neck of land lying between the old channel of the Son River and the Ganges, at their junction, and immediately adjacent to the modern city of Patna.

Tibet.

An Englishwoman in Thibet. By Annie R. Taylor. Size 10 × 6½, pp. 11. *From the "National Review" for September*, 1893.

AFRICA.

Africa. **Brown.**

The Story of Africa and its Explorers. By Robert Brown, PH.D. Vol. II. The River of Egypt—The Great Lakes—Across the Continent—The Congo. With two hundred original illustrations. London, Cassell & Co., 1893: size 10½ × 7½, pp. viii. and 312. *Presented by the Publishers.*

Being popular rather than systematic in its plan, this book should help to spread a knowledge of Africa in quarters where a more elaborate treatise would find no admittance. In this volume Dr. Brown has availed himself of the help of other African specialists. Dr. Murie writes the chapter on "The River of Egypt: Seekers after its Source;" Commander Cameron and Mr. F. E. Harman contribute part of several chapters, and Dr. Felkin tells the story of the exploration of the Congo.

African Languages. **Cust.**

Essay on the Progress of African Philology up to the year 1893. Prepared for the Congress of the World at Chicago, U.S., by Robert Needham Cust, LL.D. With three appendices:—A. Bibliographical Table of Languages, Dialects, Localities, and Authorities, 1883 to 1893. B. List of Translations of the Bible (whole or part) up to 1893. C. List of Scholars who have contributed to our knowledge up to 1893. London, Elliot Stock, 1893: size 9 × 6, pp. 48. *Presented by the Author*

Dr. Cust views Philology as capable of forming part of Geography. "The first branch of that science is no doubt 'Physical,' and its second 'Political,' but a third and a fourth are distinctly marked out, 'Ethnographical' and 'Linguistic.'" This little book is a supplement to the author's comprehensive 'Sketch of the Modern Languages of Africa,' published in 1883, carrying its valuable tables on to 1893.

British Central Africa. **Rankin.**

The Zambesi Basin and Nyasaland, by Daniel J. Rankin. Edinburgh and London, William Blackwood & Sons, 1893: size 8 × 5½, pp. viii. and 278. *With map and illustrations. Price* 10*s.* 6*d. Presented by the Publishers.*

Mr. Rankin writes with a sarcasm rare in travellers, and depicts in very dark colours the life and conduct of the natives and Europeans whom he encountered in his journeys on the Zambesi and in Nyasaland. A chapter on Mombasa, and another on boat-cruising on the East African coast, give a wider scope to the work than the title implies. Mr. Rankin's views of the administration of British Central and South Africa are pessimistic.

British East Africa. **M'Dermott.**

British East Africa or *Ibea*, a History of the Formation and Work of the Imperial British East Africa Company. Compiled by the authority of the directors from official documents and the records of the Company. By P. L. M'Dermott, Assistant Secretary. London, Chapman & Hall, 1893: size 8½ × 5½, pp. xvi. and 382. *Price* 6*s. With map and frontispiece (portrait of Sir Wm. Mackinnon.) Presented by the Publishers.*

This timely volume presents a concise and straightforward epitome of the origin and growth of the British East Africa Company, commencing with the first negotiations for the cession of the Sultan of Zanzibar's coast territory, and the long and troublesome disputes as to spheres of influence and boundaries with the German Company, especially as regards Vitu, Manda, Patta, and Wanga. Then follow several chapters describing and vindicating the Company's action in Uganda, and a general statement of the present position of affairs in the Territory. A bundle of appendices, reproducing the text of treaties, concessions, and diplomatic correspondence, enhances the value of the book. There is a good index.

Egypt. **Amélineau.**

La Géographie de l'Egypte à l'époque Copte. Par E. Amélineau. Paris, Imprimerie Nationale, 1893: size 11 × 7½, pp. xxxviii. and 630. *Price* 35*s.*

A very learned and laborious treatise on Coptic geography. The author has consulted the Coptic and Arabic MSS. preserved in the principal libraries of Europe with the exception of those of Berlin, Vienna, and St. Petersburg, and has culled from these documents all the names of towns, villages, hamlets, and, in some cases, even of streets. These are arranged in alphabetical order (according to the French transliteration), and under each head is summarised all that he could ascertain of the position, population, and historical changes of the place. An index of the Coptic names in the original character, and another of the names as transliterated, are given; but the volume would gain much in facility of reference if the names discussed on each page were indicated in the running title after the manner of other dictionaries.

Lagos. **Payne.**

Table of principal events in Yoruba History, with certain other matters of general interest, compiled principally for use in the Courts within the British Colony of Lagos, West Africa. By John Augustus Otonba Payne. Lagos, n. d. (1893): size 10 × 6½, pp. 114. *Presented by the Author.*

A number of useful tables are here presented, including the native phrases used to express the titles and duties of officials.

South Africa. **Noble.**

Illustrated Official Handbook of the Cape and South Africa. A *résumé* of the History, Conditions, Populations, Productions, and Resources of the several Colonies, States, and Territories. Edited by John Noble. Cape Town, J. C. Juta & Co., 1893: size 8½ × 6, pp. xvi. and 568. *Map and illustrations. Presented by Mr. John Noble.*

Another copy. London, E. Stanford, 1893. *Price* 8*s.* 6*d. Presented by Mr. E. Stanford.*

The new issue of the 'Official Handbook' embraces some account of the past and present conditions of the whole of South Africa. The information appears to have been brought up to date, and is sufficiently full for reference purposes, although in the absence of an index it is very troublesome to turn up any subject specially wanted.

NORTH AMERICA.

United States—Mississippi River. **Glazier.**

Headwaters of the Mississippi: comprising biographical sketches of early and recent explorers of the Great River, and a full account of the discovery and location of its true source in a lake beyond Itasca. By Captain Willard Glazier. Chicago and New York, Rand, McNally & Co., 1893: size 7½ × 5, pp. 528. *Illustrated. Presented by the Author.*

Captain Willard Glazier, whose expedition to the head-waters of the Mississippi is referred to in the *Proceedings* for 1887, Vol. IX., pp. 58, 119, 211, and 717, paid a second visit to the same region in 1891 with a number of friends. It appears that his claims as an explorer and discoverer have been neglected or laughed at by many American authorities, and much of this volume is devoted to personal retorts and laborious vindication. The point at issue seems to us a small one, although Captain Glazier ascribes to it much geographical importance. In the absence of a detailed survey of the region south of Lake Itasca, no geographer would be justified in pronouncing a definite judgment on the separate existence, exact elevation, or orientation of the sheet of water which the author names after himself. The map on p. 408 has no scale, and is boldly unconventional in draughtsmanship; that on p. 340 is a mere sketch with an "approximate scale of miles," and the two differ in their topography. Apart from the trifling controversy, the book is readable and the illustrations of rare excellence.

United States—Nebraska. **Bentley.**

Johns Hopkins University Studies. Eleventh Series, VII.-VIII. The Condition of the Western Farmer as illustrated by the Economic History of a Nebraska Township. By Arthur F. Bentley, A.B. Baltimore, 1893: size 9½ × 6½, pp. 92.

An account of Harrison's Township in Nebraska.

CENTRAL AND SOUTH AMERICA.

Central America.—Archæology. **Maudslay.**

Biologia Centrali-Americana, or Contributions to the Knowledge of the Fauna and Flora of Mexico and Central America. Edited by F. Ducane Godman and Osbert Salvin. Archæology, by A. P. Maudslay. London, published for the Editors by H. H. Porter, 1893: Text pp. 55–64; Plates LXXIV.–XCIX.

West Indies. **Esquemeling.**

The Buccaneers of America. A true account of the most remarkable assaults committed of late years upon the coasts of the West Indies by the Buccaneers of Jamaica and Tortuga (both English and French). Wherein are contained more especially the Unparalleled Exploits of Sir Henry Morgan, our English Jamaican hero, who sacked Portobello, burnt Panama, etc. By John Esquemeling, one of the Buccaneers who was present at those tragedies. Now faithfully rendered into English. With facsimiles of all the Original Engravings, &c. London, Swan Sonnenschein & Co., 1893: size 10 × 6½, pp. xxxvi. and 508. *Price* 15*s*. *Presented by the Publishers.*

This is "reprinted from the edition of 1684, to which is added a reprint of the very scarce Fourth Part, by Basil Ringrose (1685), containing the 'Dangerous Voyage and Bold Attempts of Captain Bartholomew Sharp and others.' Edited with an Introduction by Henry Powell." It is a handsome reprint, recalling the memory of a very stirring time in West Indian history, when the Buccaneers were not yet lost to feelings of patriotism, and had not wholly sunk into the ignominy of pirates.

POLAR REGIONS.

Antarctic Continent. *R.G.S. Supplementary Papers* **3** (1893): 607–637. **Forbes.**

The Chatham Islands: their Relation to a Former Southern Continent. *With map.*

This paper was read at an evening meeting of the Society, and is published with the discussion which took place on the occasion.

Greenland. *Ausland* **66** (1893): 662–663, 679–682. **Rink.**

Nachhall der ersten Nansen-Expedition. Berichte der Eskimos Arkaluk und Weleme in Godthaab. (Uebersetzt von Signe Rink in Christiania).

Translated from a native journal, these articles show how the unexpected visit of Dr. Nansen and his companions to Godthaab stirred the quaint little community in which they spent a winter, and incidentally they serve as an interesting commentary on Dr. Nansen's last book, 'Eskimo Life.'

Nansen's Expedition. *Norske G. S. Årbog* **4** (1892–93): 86–104. **Bjørlikke.**

Den Norske nordpolsekspedition. K. O. Bjørlikke.

This short notice of the equipment of the *Fram* is accompanied by illustrations of the ship as completed, and portraits of Nansen and his eleven companions.

Peary's First Journey. *Norske G. S. Årbog* **4** (1892–93): 24–44. **Astrup.**

Eivind Astrup: Løitnant Peary's Grønlandsekspedition 1891–92.

Gives, with a map, an account of Peary's discovery of Independence Bay. Mr. Astrup, it will be remembered, was Mr. Peary's second in command on the expedition, and has again gone out with him on his present journey.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Historical. **Calvert.**

The Discovery of Australia. By Albert F. Calvert. London, George Philip & Son, 1893: size 10½ × 7½, pp. vi. and 92. *With maps and illustrated appendix. Price* 10*s.* 6*d. Presented by the Publishers.*

Another copy, specially bound. *Presented by the Author.*

Mr. Calvert suggests no theory and makes no new claims as to priority of discovery, but limits himself to reproducing certain early maps to indicate the growth of our knowledge of Australia, and acknowledges his indebtedness to many other writers for the notes which accompany them.

Polynesia. **Melville.**

Typee: a narrative of a four months' residence among the natives of a valley of the Marquesas Islands; or a peep at Polynesian Life. By Herman Melville. New edition, with a Memoir of the Author and Illustrations. London, John Murray, 1893: size 7½ × 5, pp. xxx. and 302. *Price* 3*s.* 6*d. Presented by the Publisher.*

Omoo: a narrative of adventures in the South Seas; a sequel to 'Typee; or, the Marquesas Islanders.' By Herman Melville. New edition, with a Memoir of the Author and Illustrations. London, John Murray, 1893: size 7½ × 5, pp. xxvi. and 322. *Price* 3*s.* 6*d. Presented by the Publisher.*

Mr. Murray has conferred no slight favour on the public by producing a new edition of these delightful travels, which abound with adventures enough to please the most careless, are written with a simple honesty which makes them charming as literary productions, and detail the state of things in Polynesia half a century ago when the idyllic life of the peaceful primitive peoples had not been everywhere broken in upon by the trader and missionary.

Western Australia. **Calvert.**

The Mineral Resources of Western Australia. By Albert F. Calvert. London, George Philip & Son, 1893: size 7½ × 5, pp. 180. *Price* 2*s. Presented by the Publishers.*

All except thirty pages are devoted to the description of West Australian goldfields; the remainder treats of other mineral resources. Mr. Calvert made two journeys in Western Australia in behalf of "Exploration companies."

Western Australia. **Streich.**

Scientific Results of the Elder Exploring Expedition. Geology and Meteorology. By Victor Streich. Size 8½ × 5½, pp. [68]. *Extract. Presented by the Author.*

The report is illustrated by a sketch-map of the geology of the route, and by numerous other illustrations.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Climate and Famines. *Ausland* **66** (1893): 673–677. **Krebs.**

Witterungsverlegung von niederen nach höheren Breiten. Von Wilhelm Krebs (Berlin).

An attempt to connect the occurrence of years of scarcity with weather changes from south to north in different parts of the world.

Density of the Earth. *Sitzb. A. W. Wien. (Abt. IIa.)* **101** (1893): 1528–1536. **Tumlirz.**

Die Dichte der Erde, berechnet aus der Schwerebeschleunigung und der Abplattung.

Summarised on p. 375, this volume.

Oceanography. *C. R.* **116** (1893): 1321–1324. **Buchanan.**

Sur la densité et l'alcalinité des eaux de l'Atlantique et de la Méditerranée.

Summarised on p. 374, this volume.

Oceanography. **Schott.**

Wissenschaftliche Ergebnisse einer Forschungsreise zur See, ausgeführt in den Jahren 1891 und 1892. Von Dr. Gerhard Schott. Gotha, Justus Perthes, 1893: size 11 × 8, pp. 132. *Maps, tables, and diagrams. Price* 8 *marks.*

This forms Ergänzungsheft No. 109 of *Petermanns Mitteilungen*, and its contents will be separately summarised.

Oceanography—Atlantic. **Krümmel.**

Reisebeschreibung der Plankton-Expedition. Von Dr. Otto Krümmel, Professor der Geographie in Kiel. Kiel and Leipzig, Lipsius and Tischer, 1892: size 13½ × 11, pp. 330. *Maps and illustrations.*

Geophysikalische Beobachtungen der Plankton-Expedition. Von Dr. Otto Krümmel. Mit 2 Karten. Kiel and Leipzig, Lipsius and Tischer, 1893: size 13½ × 11, pp. 120. *Presented by the Author.*

These volumes form the geographical part of the publications of the scientific results of the voyage of the *National* for the investigation of the biological conditions of the Atlantic Ocean in 1889. The publication will include a large number of monographs on the various forms of life collected. The narrative of the voyage, and a summary of the physical results, will be referred to at greater length in an article in the *Journal*.

Oceanography—Baltic. *Ausland* **66** (1893): 627–630, 648–651. **Schück.**

Beobachtungen über Salzgehalt und specifisches Gewicht des Meerwassers zwischen den Norwegischen Scheren. Von A. Schück, Hamburg.

A discussion of the method of determining the density of sea-water and its value at various temperatures.

Plant Distribution, **Jännicke.**

Jahrb. Frankfurter V. G., &c. **55** *and* **56** (1890–92): 1–30.

Die Entdeckung Amerikas in ihren Einflusse auf die Geschichte der Pflanzenwelt in Europa. Von Dr. Wilhelm Jännicke.

A short treatise on the American plants introduced to Europe.

GENERAL.

Biographical Dictionary. **Lee.**

Dictionary of national Biography. Edited by Sidney Lee. Vol. xxxvi. Malthus—Mason. London, Smith, Elder & Co., 1893: size 9¼ × 6½, pp. vi. and 447. *Price* 15*s.*

This volume includes notices of the following names more or less connected with geography and travel:—Sir John Mandeville, by G. F. Warner; James Mangles, by Prof. J. K. Laughton; Thomas Manning, by W. P. Courtney; Charles Blackford Mansfield, by J. A. Cramt; Augustus Raymond Margary, by G. C. Boase; Lieutenant-General Frederick Markham, by H. M. Chichester; Samuel Marsden, by G. C. Boase; William Marsden, by Warwick Wroth; Charles Thomas Marvin, by G. C. Boase; and John Mason, by T. Seccombe.

Biography—De Candolle. *Deutsche Rundschau G.* **16** (1893): 40–43. **Wolkenhauer.**

Alphonse de Candolle. Von W. Wolkenhauer. *With portrait.*

Cartier's Explorations. **Winsor.**

The Results in Europe of Cartier's Explorations, 1542-1603. By Justin Winsor. Cambridge, [Mass.], J. Wilson & Son, 1892: size 9½ × 6, pp. 19. *Presented by the Author.*

Church Missionary Society. ———

Proceedings of the Church Missionary Society for Africa and the East. Ninety-fourth Year, 1892–93. London, 1893: size 8½ × 5½, pp. lxxviii., 260, and (330). *Maps. Presented by the Church Missionary Society.*

Columbus. *Norske G. S. Årbog* **4** (1892-93): 67–85. **Storm.**

Dr. Gustav Storm: Columbus på Island og vore forfædres opdagelser i det nordvestlige Atlanterhav.

Discussing the relation which the Norse discovery of America bore to the voyage of Columbus.

Commercial Treaties. **Hertslet.**

A Complete Collection of the Treaties and Conventions, and Reciprocal Regulations at present subsisting between Great Britain and Foreign Powers, &c., &c, Compiled . . . and edited by Sir Edward Hertslet, K.C.B. Vol. xviii. London, Butterworths, 1893: size 9 × 6, pp. xxxii. and 1332.

This volume contains the treaties and other documents from January 1st, 1888, to December 31st, 1890, and some of earlier dates which were not published in previous volumes.

Geographical Exhibition. *B.S.R. Belge G.* **17** (1893): 311–359. **Blanc.**

L'Exposition Géographique de Moscou en 1892. Par M. Edouard Blanc.

This is a good general account of the Moscow geographical exhibition, which took place last year and excited almost no interest in this country. M. Blanc shows that the exhibition was really both interesting and important, giving occasion for a number of demonstrations in which various classes of exhibits were described by specialists. It was mainly a Russian exhibition, and the few foreigners whom the dread of cholera did not deter from visiting Moscow, were much impressed by the excellence of the work done by the official geographical institutions.

Geographical Teaching. **Viguier.**

La Géographie dans les Chaires de l'Université. Par Maurice Viguier, Docteur ès Sciences. Avignon, Seguin Frères, 1893; size 10 × 6½, pp. 32.

A clever, but not too good-natured, pamphlet, pointing out the slipshod writing in elementary text-books written by French geographers of University standing.

Geographical Year-book. **Wagner.**

Geographisches Jahrbuch. XVI. Band, 1893. . . . herausgegeben von Hermann Wagner. Gotha, Justus Perthes, 1893: size 9 × 6, pp. 500. *Price* 12 *marks.*

This invaluable epitome of geographical progress contains articles on "Advances in Physical Geography in General," by Dr. H. Hergesell and Dr. E. Rudolph; on "The Geological Aspects of Physical Geography" (IV. 1890–92), by Dr. Franz Toula; "Report on Oceanography for 1891–92," by Professor O. Krümmel; "Report on the Geography of Plants (1890–92)," by Dr. O. Drude; "Record of Geographical Exploration in Extra-European Regions," by Dr. F. Hahn, for Australasia and Africa; Dr. G. Wegener, assisted by Professor D. N. Anutschin, of Moscow, for Asia (this section is exceptionally rich in Russian exploration), Dr. W. Sievers for Latin America, and Dr. B. Weigand for North America. Last in the table of contents, though first in the book, is a paper by Professor Egli on "Progress in the Study of Geographical Names."

Historical Geography—Madoc. **Stephens.**

Madoc. An Essay on the Discovery of America. By Madoc ap Owen Gwynedd in the Twelfth Century. By Thomas Stephens. London, Longmans, Green & Co., 1893: size 9 × 6, pp. xviii. and 250. *Price* 7*s.* 6*d.* *Presented by the Publishers.*

Further notice will be taken of this book.

Portuguese Missions. **D'Orsey.**

Portuguese Discoveries, Dependencies, and Missions in Asia and Africa. Compiled by the Rev. J. D. D'Orsey, B.D. London, W. H. Allen & Co., 1893: size 8 × 5, pp. xvi. and 434. *Price 7s. 6d. Presented by the Publishers.*

The title is somewhat misleading, as the volume deals mainly with the ecclesiastical history of European intercourse with India. At the beginning, fifty pages are devoted to Portuguese discoveries and conquests in the fifteenth and sixteenth centuries; and the remainder of the work is divided into four books, entitled respectively—The Portuguese Missions in Southern India, The subjugation of the Syrian Church, Subsequent Missions in Southern India, with special reference to the Syrians, The Portuguese Missions, with special reference to modern Missionary Efforts in South India. These titles are descriptive of the subject-matter; but the utility of the whole as a work of reference is neutralised by the want of an index.

Transit of Venus.

Observations of the Transit of Venus, 9 December, 1874; made at Stations in New South Wales. Under the direction of H. C. Russell, B.A., &c. Sydney, C. Potter, 1892; size 11 × 9, pp. xxviii. and 43. *Illustrated with photographs and drawings.*

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Karte des Deutschen Reiches. Scale 1 : 100,000, or 1·5 statute mile to an inch. Herausgegeben von der Kartogr. Abtheilung der Königl. Preuss. Landes-Aufnahme 1893. Sheets:—139, Borkum; 482, Hof; 617, Offenburg; 631, Waldkirch. *Price, 1·5 mark each sheet.*

Germany. **Vogel.**

Karte des Deutschen Reichs im Massstab 1 : 500,000 (or 7·9 stat. miles to an inch) unter redaktion von Dr. C. Vogel ausgeführt in Justus Perthes' Geographischer Anstalt in Gotha. 27 Blätter in Kupferstich. *Price of the complete map, 42 marks.*

With the issue of sheet 27 (Munich) this excellent map of the German Empire is complete. It is twelve years since it was commenced, and the compilation must have entailed a vast amount of work. As a specimen of cartography it leaves nothing to be desired, and reflects credit on all concerned in its production. The hill-work is in brown, and is most effective, the lettering clear, and the main rivers and lakes are in blue. For purposes of general reference this map will be found much more convenient than the large Government survey map, on the scale of 1 : 100,000, the bulk of which, indeed, renders it unsuited for private collections. The parts, each containing two maps, may be purchased separately, and an index of all the names which appear on the map will shortly be issued.

Mont Blanc. **Whymper.**

The Chain of Mont Blanc, by E. Whymper, after the surveys of Captain Mieulet, General Dufour, and Mr. A. A. Reilly. Engraved by J. Addison, Jun. Scale, 1 : 104,544, or 1·65 stat. miles to an inch. *Presented by E. Whymper, Esq.*

This map has been compiled by Mr. Edward Whymper, from all the most reliable sources, and from his own personal observations. It contains several important corrections on previously published maps. Is drawn in a remarkably clear and effective style, and is a fine specimen of engraving. It shows the author's routes, routes of other mountaineers, and frontiers. The heights are also shown in English feet.

ASIA.

India. **Surveyor-General of India.**

Indian Atlas. Quarter Sheets: 4A, N.E. Part of Cutch (Bombay Presidency). 129, N.E. Parts of District Lakhimpur (Assam), and the Miri and Mishmi Hills. 130, S.W. Parts of Districts Nowgong, Cachar and Naga Hills, and Manipur Native State (Assam). Sheets: 29, District Gujrat and Parts of Districts Jhelum, Rawal-Pindi, and Sialkot (Punjab), with Parts of Kishtwar, Nowshera, Badrawar, and Jummoo (Kashmir Territory). 68, Districts Etah, Farukhabad, Manipuri, Etawah, Cawnpore, and Budaon, of the North-West Provinces, with Sitapur, Hardoi, Unao and Kheri, of Oudh, and Part of Gwalior and Dholpur (Native States). 74, Parts of Districts Yelgandal, Indur, Medak, Sirpur Tandur, and Khamamet (Nizam's Dominions), District Chanda and Native State Bastar (Central Provinces). 75, Parts of Districts Medak, Yelgandal, Hyderabad, Khamamet, Nagadkarnul, and Nalgonda (Nizam's Dominions), and Kistna (Madras Presidency). 106, Part of District Sambalpur and Garhjat States of Raigarh, Sarangarh, Sonpur, Rairakhol, and Bamra (Central Provinces), and Baud, Athmallik and Angul (Orissa Tributary States). 116, Parts of Districts Cuttack, Puri, and Tributary States of Baramba, Nayagar, Ranpur, Tigiria, &c. (Bengal).—India, showing railways with stations, accompaniment to alphabetical list of stations on Indian Railways, corrected to June 30th, 1892, 1 inch to 64 miles. 2 Sheets.—Bombay Survey, 1 inch to a mile: No. 188, Parts of Baroda State and Khandesh District. Season 1890–91. No. 304, Districts Belgaum and Bijapur, and States Ramdurg, Mudhol, and Kolhapur. Seasons 1890–91.—Punjab Survey, 1 inch to 1 mile. No. 213, District Ferozepore, and Bahawalpur State with overlap of District Montgomery. Seasons 1869–70, 1877–79, and 1887–88. No. 239, Districts Ferozepore, and Ludhiana and Sikh States. Seasons 1887–88, and 1889–90. No. 240, Districts Ludhiana and Ferozepore, and Sikh States. Seasons 1887–88 and 1889–90. No. 256, District Hissar and Patialar State. Seasons 1847–50, 1870–72, 1883–84 and 1888–90. No. 271, Parts of Districts Ludhiana and Karnal, and Sikh States. Season 1887–88. No. 273, District Karnal, and Sikh States. Seasons 1870–72 and 1887–88.—Assam Survey, 1 inch to a mile. Sheet No. 25 (2nd Edition), District Kamrup. Seasons 1866–68 and 1883–86. No. 97, District Lakhimpur. Seasons 1869–71. No. 113, District Lakhimpur. Seasons 1867–70. No. 128. District Lakhimpur. Seasons 1867–70. No. 145, District Lakhimpur. Season, 1872–73. No. 146, District Lakhimpur. Season 1872–73.—Bengal Survey, 1 inch to a mile. No. 361, District Mymensingh. Seasons 1850–57.—Madras Survey, 1 inch to a mile. No. 150, Part of District Madura. Seasons 1879–88.—Lower Burma Survey, 1 inch to a mile. No. 143 (2nd Edition), District Bassein. Seasons 1880–81 and 1886–87. No. 144, District Bassein. Season 1886–87. No. 185 (2nd Edition), Districts Bassein, Henzada, and Thongwa. Seasons 1881–85 and 1888–89. No. 187 (2nd Edition), Districts Bassein and Thongwa. Seasons 1880–82 and 1888–89. No. 188 (2nd Edition), Districts Bassein and Thongwa. Seasons 1879–81 and 1887–91. No. 190, District Thongwa. Season 1890–91, No. 233 (2nd Edition), Districts Hanthawaddy and Thongwa. Seasons, 1882–83 and 1888–89. No. 283 (2nd Edition), Districts Hanthawaddy and Thongwa. Seasons 1881–82 and 1890–91. No. 284, District Thongwa. Season 1890–91.—Map of Punjab, 16 miles to 1 inch. 2 Sheets, 1893.—The Province of Assam under the jurisdiction of the Chief Commissioner, 24 miles to 1 inch, with additions and corrections up to 1891.—Mysore, 16 miles to 1 inch, February, 1893. Map of the Fyzabad Division, prepared in accordance with Govt. N.W.P. and Oudh P.W. Dept., Circular No. E, dated May 16th, 1872. Revised up to April 1st, 1892, 4 miles to 1 inch. 4 sheets.—Map of the Lucknow Division, prepared in accordance with Govt. N.W.P. and Oudh, P.W. Dept., Circular No. E, dated May 16th, 1872. Revised up to April 1st, 1891, 4 miles to 1 inch. 3 sheets.—District Midapore, 4 miles to 1 inch. Additions to January, 1893.—District Palamau, Bengal, 1 inch to 12 miles. 1893.—District Baraich, N.W.P. and Oudh, 1 inch to 8 miles. 1892.—District Balasore, Bengal, 1 inch to 8 miles. 1890. *Presented by H.M. Secretary of State for India, through India Office.*

Japan. **Naumann.**

Der Krater des Shiranesan bei Ksats nach der Explosion vom 6 August, 1892. Scale 1 : 63,000, or 1·02 statute mile to an inch. Ansichten des Bandai. Stereographische Darstellung der Geologie Japans. Von Dr. Edmund Naumann. Höhenschichten-Karte von Japan. Von Dr. Edmund Naumann. Scale 1 : 2,600,000, or 41 statute miles to an inch. *Petermanns Geographische Mitteilungen.* Ergänzungsheft, No. 108. Taf. 1, 2, 3. Gotha, Justus Perthes, 1893. *Presented by the Publisher.*

AMERICA.

Cherokee Outlet. **Rand, McNally & Co.**

New Sectional Map of the Cherokee Outlet. Scale, 1 : 316,800, or 5 stat. miles to an inch. Rand, McNally & Co., Chicago and New York, 1893. *Presented by the Publishers, through E. Stanford.*

This map has been specially prepared for the use of settlers in the Cherokee Outlet, a district which was thrown open to settlers by the president's proclamation on September 16th, 1893. The map is accompanied by a summary of the United States pre-emption and homestead laws, and the price of land in different districts is also given.

United States. **Rand, McNally & Co.**

Rand, McNally & Co.'s Indexed County and Township Pocket Map and Shippers' Guide of Alabama, Scale 1 : 854,100, or 13·5 stat. miles to an inch.—Arkansas. Scale 1 : 854,100, or 13·5 stat. miles to an inch.—California. Scale 1 : 2,629,400, or 32·0 stat. miles to an inch.—Florida. Scale 1 : 854,100, or 13·5 stat. miles to an inch.—Mississippi. Scale 1 : 854,100, or 13·5 stat. miles to an inch. Rand, McNally & Co., Chicago and New York, 1893. *Price* 1*s.* 2*d. each. Presented by the Publishers, through E. Stanford.*

These belong to a series of maps in course of publication by Rand, McNally & Co., of Chicago and New York. They have been specially prepared for the use of tourists and persons doing business in the United States.

AUSTRALASIA.

Celebes. **Wichmann.**

Die Binnenseen von Celebes. Von Dr. A. Wichmann. Das Stromgebiet des Tjenrana (Süd-Celebes). Der See von Tondano und seine Umgebung. Geologische Skizze der Umgebung des See von Limbotto. *Petermanns Geographische Mitteilungen.* Jahrgang, 1893. Taf. 16. Justus Perthes, Gotha. *Presented by the Publisher.*

PACIFIC OCEAN ISLANDS.

Marshall Islands. **Linnemann.**

Langhans: Beiträge zur Kenntnis der Deutschen Schutzgebiete Bl. 4. Dschalut (Regierungssitz des Schutzgebietes der Marshall Inseln). Auf Grundlage einer Vermessung des Ingenieurs B. Linnemann. With insets. *Petermanns Geographische Mitteilungen.* Jahrgang, 1893. Tafel 17. Justus Perthes, Gotha. *Presented by the Publisher.*

GENERAL.

Historical Geography. **Schrader.**

Atlas de Géographie Historique. Ouvrage contenant 54 grandes Cartes doubles en couleurs, accompagnées d'un Texte Historique au dos et d'un grand nombre de cartes de détail, figures, diagrammes, etc. Par une Réunion de Professeurs et de Savants sous la direction géographique de F. Schrader, Directeur des travaux cartographiques de la librairie Hachette et Cie. Paris, Librairie Hachette et Cie., 1893. 2me Livraison. *Price* 1 *fr.* 50 *c. Presented by the Publishers.*

The present issue contains maps of the World in 720 B.C., with insets; Europe, after the Peace of Utrecht; and the Colonial expansion of England and France from 1815 to 1893. The maps are each accompanied by descriptive letterpress.

Physical Geography. **Staggemeier.**

First Part of the General Maps for the Illustration of Physical Geography. Edited by Axel Staggemeier, Copenhagen, 1893. Pl. I. Prospect of Geographical Positions between the Arctic Pole and the parallel on 30° N.—Pl. II. Prospect of Geographical Positions on the Atlantic Face of the Middle-Zones.—Pl. III. Prospect of Geographical Positions on the Pacific Face of the Middle-Zones.—Pl. IV. Prospect of Geographical Positions on the Indian Face of the Middle-Zones.—Pl. V. Prospect of Geographical Positions, between the Antarctic Pole and the Parallel on 30° S. E. Stanford, London. *Price* 8*s*. *Presented by E. Stanford.*

These are a nicely drawn set of maps, specially constructed for the purpose of furnishing geographers with the means of plotting on them routes, magnetic curves, physical phenomena, &c., for which purpose they are well suited.

The World. **Andree.**

Andrees allgemeiner Handatlas in 91 Haupt- und 86 Nebenkarten, nebst vollständigem alphabetischem Namenverzeichnis. Dritte, völlig neubearbeitete und vermehrte Auflage. Herausgegeben von der geographischen Anstalt von Velhagen & Klasing in Leipzig. Bielefeld und Leipzig; verlag von Velhagen & Klasing, 1893. *Price* 28 *marks.*

This is a new edition of Andree's Handatlas, which has been corrected and brought up to date. It contains ninety-one principal, and eighty-six inset maps, and is furnished with an alphabetical index containing all the names that appear on the maps.

The World. **Debes.**

E. Debes' neuer Handatlas über alle Teile der Erde in 59 haupt- und weit über 100 Nebenkarten, mit alphabetischen Namenverzeichnissen. Ausgeführt in der geographischen Anstalt der Verlagshandlung. Leipzig. H. Wagner & E. Debes. Parts 1 and 2. 1·80 *marks each part. Presented by the Publishers.*

These form the first two parts of a general atlas which will be published in seventeen parts, and, when completed, will consist of fifty-nine principal maps and one hundred insets. The present issues contain maps of Alsace-Lorraine and North-east France, South-east Russia, North-east Germany, Italy, and Greece. The maps are very nicely drawn, and each is accompanied by an index.

The World. **German Admiralty.**

Weltkarte zur übersicht der Meerestiefen, mit Angabe der unterseeischen Telegraphen-Kabel und Überland-Telegraphen, sowie der Kohlen-Stationen und Docks. Herausgegeben von dem Reichs-Marine-Amt. Nautische Abtheilung. Ausgabe mit Meerestiefen und Höhenschichten, 1893. Scale 6½° (Equal.) to an inch. Mercator's Projection. Berlin, Geographische Verlagshandlung, D. Reimer. Inhaber, Hoefer & Vohsen. 3 sheets. *Price* 14 *Marks. Presented by the Publishers.*

The colouring of this map is well-chosen to illustrate the purposes for which it has been published. Heights of the land are indicated by different shades of brown, from sea-level to over 2000 metres; depressions below sea-level are coloured green. The depths of the ocean are shown in five different shades of blue, extending to 6000 metres. In addition to this, a great deal of useful information with regard to dock, coaling-stations, and telegraphic communication, is indicated by symbols; some of the railways, however, are not up to date, none being laid down in Natal, or in Portuguese East Africa, and Angola. The map is very nicely drawn, and the registering is perfect.

The World. **Muller.**

Remarkable Maps of the 15th, 16th, and 17th centuries, reproduced in their original size. Part I. The Bodel Nyenhuis Collection at Leyden. Amsterdam, Frederik Muller and Co., 1894. *Price* £1 10*s*. *Presented by the Publishers.*

This is the first part of an important series of facsimiles of maps of the 15th, 16th, and 17th centuries, taken from the Bodel Nyenhuis Collection at Leyden. It is the intention of the publishers to issue six of such parts, which will contain maps of the highest interest for the history of geography of North America, Brazil, the Pacific

Ocean, and Australasia. They have been produced, in a very satisfactory manner, by photo-lithography, on Dutch hand-made paper, and it is announced that only one hundred copies will be printed. The present issue contains the following maps:—1–4. Gastaldi's (?) Map of the World. Venice, Tramizini, 1554.—5–6. Globe, published at Lyons by Guilielmus Nicolai Belga, 1603.—7–8. Franciscus Hoeius' Map of the World, *circa* 1600; re-published, with later discoveries, by Hugo Allardt, Amsterdam, *circa* 1640.—9. Abraham Goos' Globe, published by Joh. Janssonius at Amsterdam, 1621.—10. Ferrando Berteli's Map of Parts of America, Western Europe, and Africa, *circa* 1560.—11. Paulo Forlani's Map of Africa, Venice, 1562.—12. America and the Pacific Ocean. Venice, published by Rascicotti, engraved by Mazza, *circa* 1583.—13. Nova Francia, Italian Map, *circa* 1560.—14. Dutch East Indies, Venice, *circa* 1560.

The World. **Pennesi.**

Atlante Scolastico per la Geografia Fisica e Politica di Giuseppe Pennesi. Istituto Cartografico Italiano. Roma, 1894. Fascicolo I. *Price* 3·80 *li.* *Presented by the Istituto Cartografico Italiano.*

Considering the very moderate price of this atlas, it is worthy of more than a mere announcement of its publication. It contains a set of general physical maps in addition to which there are orographical and political maps of the separate continents and Italy. An excellent feature in this atlas is that physical and political maps of each continent which, with the exception of Europe, are drawn on an uniform scale, face one another, which arrangement will be of great assistance to pupils, for whose use the atlas is published.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty. July, August, September and October, 1893. *Presented by the Hydrographic Department, Admiralty.*

No.			Inches.	
1821	m	=	1·55	France, north coast:—Asnelles to Villero, including Caen Roadstead. 2*s.* 6*d.*
2210	m	=	various	Black Sea:—Karaji Bay. Eupatoria Road. Yalta Road. Utrish Point Anchorage. Jubg Anchorage. Poti Harbour. Tuabs Anchorage. Yalta and Urzuf Roads. 1*s.* 6*d.*
2200	m	=	5·78	Newfoundland, west coast:—Port Saunders, Keppel and Hawke Harbours. 1*s.* 6*d.*
407	m	=	4·0	Canada, Lake Huron:—Penetanguishene Harbour. 1*s.* 6*d.*
1155	m	=	various	South America, north coast:—Entrance to the Maroni River. Surinam River, from the Light-vessel to Domburg. Entrance to the Coppename and Saramacca Rivers. Entrance to the Corentyn River. 1*s.* 6*d.*
1294	m	=	various	Plans on the coast of Peru:—Talara Bay. Lambeyeque Road. Pecasmavo Road. Malabrigo Bay, Huanchaco Road. Bay of Santa. Casma Bay. Port Samanco or Guambacho. Huarmey Bay. 1*s.* 6*d.*
1948	m	=	2·01	Red Sea, western shore:—Mersa Makdah and Approach to Trinkitat. 1*s.* 6*d.*
59	m	=	4·5	India, west coast:—Deogarh Harbour. 1*s.* 6*d.*
2056	m	=	0·23	Eastern Archipelago:—Sunda Strait and Approaches. Plans:—Kalambayang Harbour. Kiloang Harbour. New Anjer Road. Fourth Point to Old Anjer. 2*s.* 6*d.*
1936	—	—	—	Island in the North Pacific Ocean:—Plan added, Melpomene Cove.
1826	m	=	0·05	England, west coast:—Formby Point to Kirkcudbright. 3*s.*
2607	m	=	0·49	Mediterranean, south coast of France:—Marseille to Agay Road. 2*s.* 6*d.*

No.			Inches.	
2608	m	=	0·98	Mediterranean, south coast of France:—Approaches to Toulon. 2*s.* 6*d.*
1841	m	=	0·28	Mediterranean, west coast of Italy:—Civita Vecchia to Naples. 2*s.* 6*d.*
1483	m	=	2·41	Adriatic Sea:—Parts Chioggia, Malamocco, and Lido, and the channels leading to Venice. 2*s.* 6*d.*
1947	m	=	0·52	North America, west coast:—Admiralty inlet and Puget Sound. 2*s.* 6*d.*
1862	m	=	0·24	Africa, west coast:—Lekki to River Dodo. 2*s.* 6*d.*
1890	m	=	24·0	Australia, east coast:—Woolloomooloo and Farm Cove anchorages. 1*s.* 6*d.*
1350	m	=	12·0	Australia, east coast:—Cook Harbour. 1*s.*
1486	m	=	various	South Pacific Ocean, New Hebrides:—Anchorages in New Hebrides Islands. 1*s.* 6*d.*
585	—	—	—	Anchorages in the Strait of Georgia:—Plan added, Union wharf and anchorage.

(*J. D. Potter, Agent.*)

CHARTS CANCELLED.

No.		Cancelled by—	No.
2211	Yalta and Urzuf Roads	New sheet. Plans in the Black Sea	2210
2236	Plan of Polti Harbour on this chart		
407	Penetanguishene Harbour	New Plan. Penetanguishene Harbour	407
	Goderich Harbour ..		
1155	Mouth of the River Corentyn	New Plans. Entrance to the Maroni River, &c.	1155
	Mouth of the River Maroni		
2908	Surinam River		
1813	Plan of Talara Bay on sheet	New sheet. Plans on the coast of Peru	1294
1294	Plans on this sheet ..		
1311	Plans on this sheet ..		
1368	Plans on this sheet ..		
59	Deogarh Harbour ..	New Plan. Deogarh Harbour ..	59
2056	Sunda Strait and its approaches	New Chart. Sunda Strait and approaches	2056
1508	Plan of Shepherd Isles on this sheet		
1826	Formby Point to Firth of Solway	New Chart. Formby Point to Kirkcudbright	1826
2607	Marseille to Hyeres ..	New Chart. Marseille to Agay road	2607
2608	Hyeres to Rade d'Agay		
1483	Ports Malamocco and S. Nicolo del Lido, with the channels leading to Venice	New Chart. Ports Chioggia, Malamocco, and Lido, and the channels leading to Venice	1483
1947	Admiralty Inlet and Puget Sound	New Chart. Admiralty Inlet and Puget Sound	1947
1862	Lekki to River Forcados	New Chart. Lekki to River Dodo	1862
1350	Cook Harbour	New Plan. Cook Harbour ..	1350
1508	Plan of Tangoa anchorage on this sheet ..	New Plan. Tangoa Anchorage on	1486
376	St. Antonio Island.		
380	Bonavista Island.		
383	St. Jago Island.		

CHARTS THAT HAVE RECEIVED IMPORTANT CORRECTIONS:

No. 30, England, south coast:—Plymouth Sound and Hamoaze. 2682, Bristol Channel:—Nash Point to New Passage. 108, England, east

coast:—The Wash. 2329, Norway, south coast:—Sandö to Stevöer. 2603, France, south coast, Palamos to Cape Béarn. 1184, Africa, north coast:—Bay and Lake of Tunis. 2830A, River St. Lawrence, Quebec, to point du Lac. 2830B, River St. Lawrence:—Point du Lac to Lachine Rapids. 1901, North America, west coast:—Ogden Channel, with anchorages between Cape Caution and Port Simpson. North America, west coast:—Port Simpson. 671, Africa, east:—Port Durnford. 40, India, west coast:—Karáchi Harbour. 1353, Malacca Strait:—Diamond Point to North Sands. 1342, Cochin China:—Fang-rang Bay to Tong-king Gulf. 1994, China, east coast:—San-Mun Bay and Sheipu Harbour. 205, Japan Nanao Harbours. 2657, Japan, Gulf of Tokyo or Yedo. 732, Pacific, Gilbert Islands:—Makin and Taritari. Tarawa. Maraki. Apaiang. Maiana. (*J. D. Potter, Agent.*)

No. 1951, England, west coast:—Liverpool Bay. 2476, Scotland, west coast:—Firth of Lorn. 1352, France, north coast:—Dunkerque. 2328, Norway:—Christiansand to Sandö. 2500, Baltic, Gulf of Bothnia:—Stiernö Point to Fiaderäg. 169, Sicily:—Palermo Bay. 2733, Iceland:—Portland to Snefells Jökel. 259a, River St. Lawrence:—Montreal to Ogden Island. 1365, Africa, west coast:—Baffu Bay to Grand Berebi. 1361, Africa, west coast:—Fernando Po to Cape Lopez. 1003, Africa, east coast:—Pungwe River. 928, Sulu Sea:—Sulu Archipelago. 2637, Eastern Archipelago:—Strait of Makassar, south part. 1466, China, south coast:—Hongkong. Fotaumun Pass. 2415, Japan:—Nagasaki Harbour. 2875, Japan:—Seto-uchi or Inland Sea. (*J. D. Potter, Agent.*)

North Atlantic Ocean. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean, November, 1893, with Supplement of six synoptic weather charts, illustrating weather conditions of two cyclones of August 1893. Published by the Hydrographic Office, Bureau of Navigation, Navy Department, Washington, D.C., 1893. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Heligoland. **Isaacson.**

Twelve photographs of Heligoland in 1890. *Presented by F. J. Wootton Isaacson.*

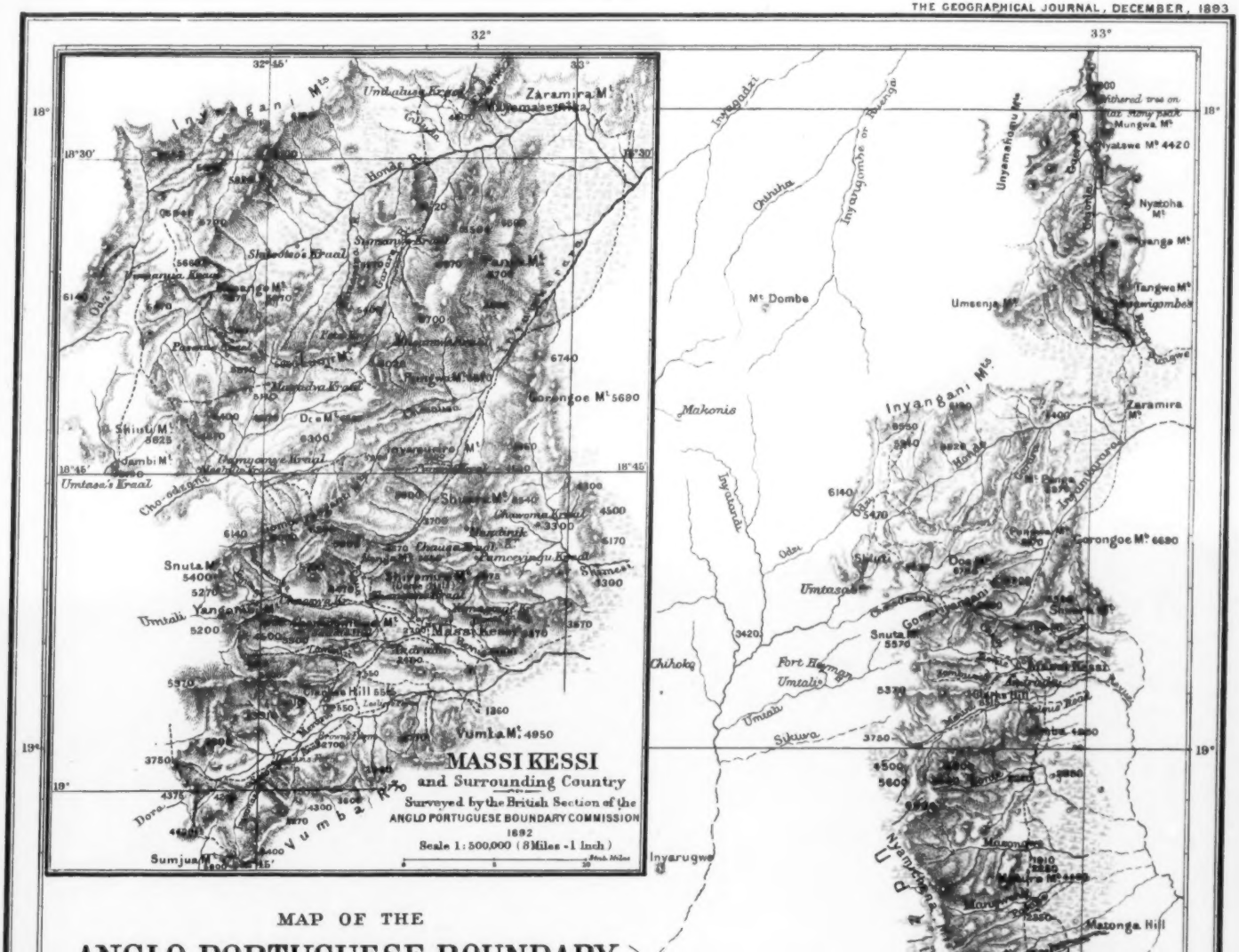
These consist of photographs taken by Mr. F. J. Wootton Isaacson just before and during the cession of Heligoland to Germany.

Kashmir. **Deasy.**

Twenty photographs taken in Kashmir. *Presented by Lieut. H. H. P. Deasy.*

This series consists of twenty photographs taken in Kashmir by Lieut. H. H. P. Deasy, 16th Lancers. They are well-chosen views of the scenery and characteristic groups of natives.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



MAP OF THE

ANGLO-PORTUGUESE BOUNDARY

MAP OF THE

ANGLO PORTUGUESE BOUNDARY

IN

EAST AFRICA.

From the North Eastern Corner of the South African Republic
to Latitude 18° S.

Constructed by the British Section of the
ANGLO-PORTUGUESE BOUNDARY COMMISSION,
1892.

By Major J.J.Leverson, R.E. British Commissioner.
Capt. S.C.N.Grant, R.E. & Lieut. C.S.Wilson, R.E.
assisted by
Sergeant D.Clarke, R.E. & 2nd Corporal T.Johnson, R.E.

Scale, 1: 1000,000. (16 Miles - 1 Inch.)

0 5 10 20 30 Geographical Miles.
0 5 10 20 30 Statute Miles.

Bush or Trees

Sabi

Umahagashu

Lundi

Mazonga Hill

Malanda's 2980

Kraals 2980

Mapinganis

Aposeh

Kangetanda's

Sherishere

Mugareps

Mahasi's

Capt Turner's Grave

Musiguboya's

Kraals

Shijanje's

Deserted Kraal

Garajwa's

Simurumis

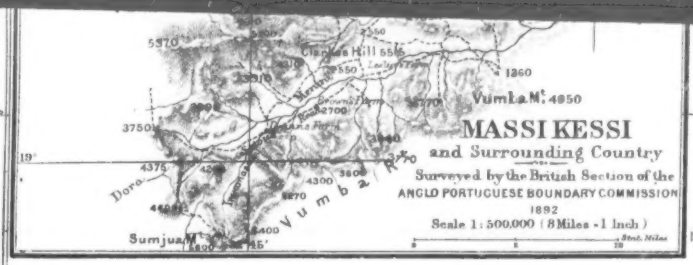
Mahenyu's

Lusitu

Umsimani

20°

21°



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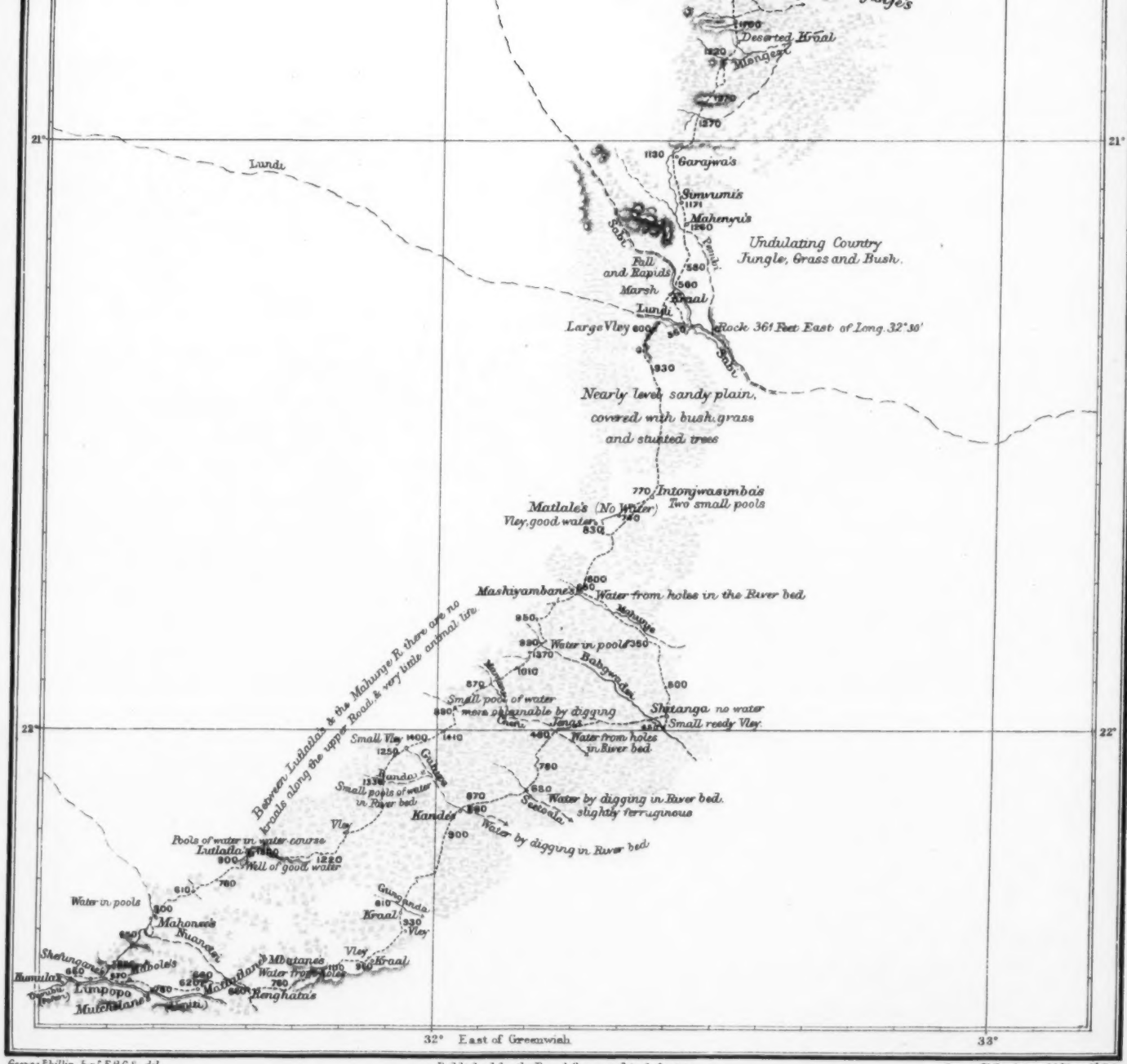
Scale, 1: 1000,000. (16 Miles - 1 Inch.)

0 5 10 20 30 Geographical Miles.
0 5 10 20 30 Statute Miles.

Bush or Trees

MASSI KESSI
and Surrounding Country

Surveyed by the British Section of the
ANGLO PORTUGUESE BOUNDARY COMMISSION
1892
Scale 1: 500,000 (8 Miles - 1 Inch)


Deserted Kraal
Mangesi
1320
1270
1130
Garajwa's
Simumis
1171
Mahenyu's
1260
Undulating Country
Jungle, Grass and Bush.
Falls and Rapids
Marsh
Kraal
Lundi
Large Vley
Rock 361 Feet East of Long 32° 30'
930
Nearly level sandy plain,
covered with bush, grass
and stunted trees
770
Intonjwasimba's
Two small pools
Matlale's (No Water)
Vley, good water
830
Mashiyambane's
Water from holes in the River bed
Mahunje
Water in pools
1370
Babgwadzi
1010
870
Small pool of water
more obtainable by digging
Shitanga no water
Small reedy Vley
Water from holes
in River bed
Small Vley
1400
1410
1250
Gwanje
Brandy's
1330
Small pools of water
in River bed
Vley
Kandes
Water by digging in River bed.
slightly ferruginous
Seitsola
Water by digging in River bed
Pools of water in water course
Lutlala
Well of good water
1220
610
780
Water in pools
300
Mahonsi's
Nuanetsi
Shetungani's
Mbatanes
Water from holes
Kraal
Vley
Mashonaland
Mbatanes
Kraal
Lundi
Lundi
Sabi
Pendi
Fall and Rapids
Marsh
Kraal
Large Vley
Rock 361 Feet East of Long 32° 30'
Nearly level sandy plain,
covered with bush, grass
and stunted trees
Matlale's (No Water)
Vley, good water
Mashiyambane's
Water from holes in the River bed
Mahunje
Water in pools
Babgwadzi
Small pool of water
more obtainable by digging
Shitanga no water
Small reedy Vley
Water from holes
in River bed
Small Vley
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Small pools of water
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Vley
Kandes
Water by digging in River bed.
slightly ferruginous
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Water from holes
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Mbatanes
Kraal
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